# Harry S. Truman Dam and Reservoir

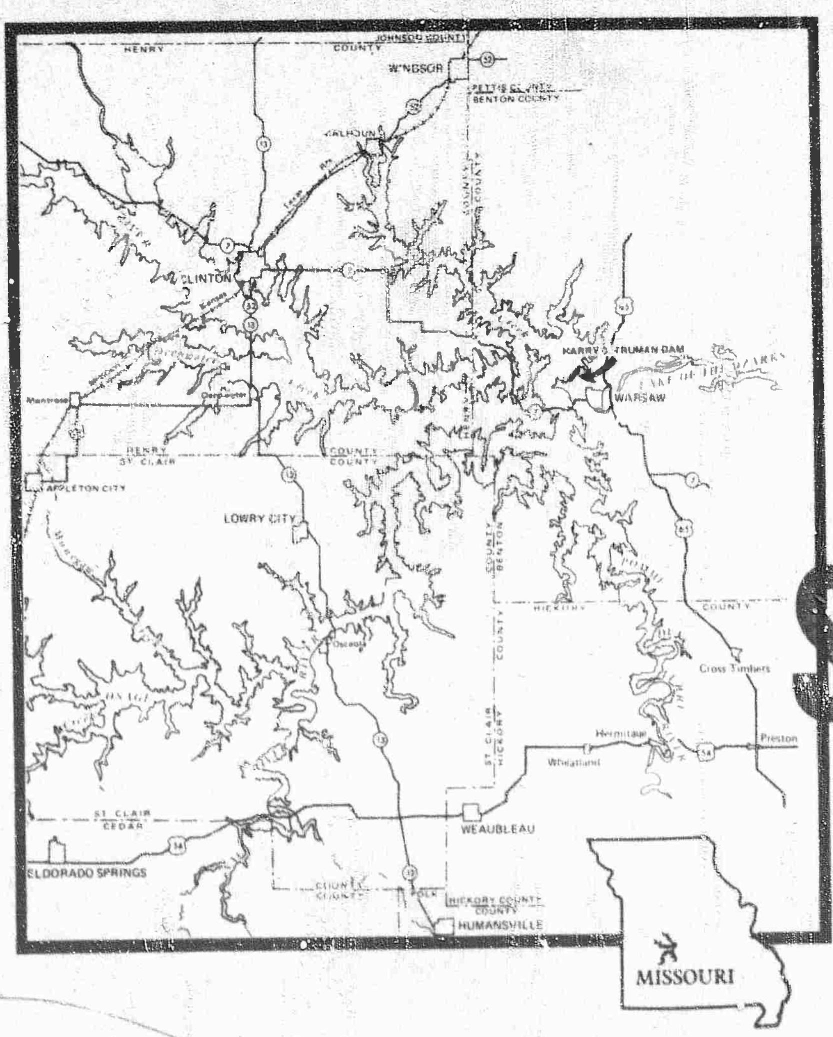
US Army Corps of Engineers
Kansas City District
*Leaders in Customer Care*

**Part 1**

**1986**

# Archeological Survey And Reconnaissance within the Ten-Year Flood Pool








Prepared by:
Commonwealth Associates, Inc.
Jackson, Michigan

Prepared for:
U.S. Army Corps of Engineers
Kansas City District
Contract Number DACW41-79-C-0101

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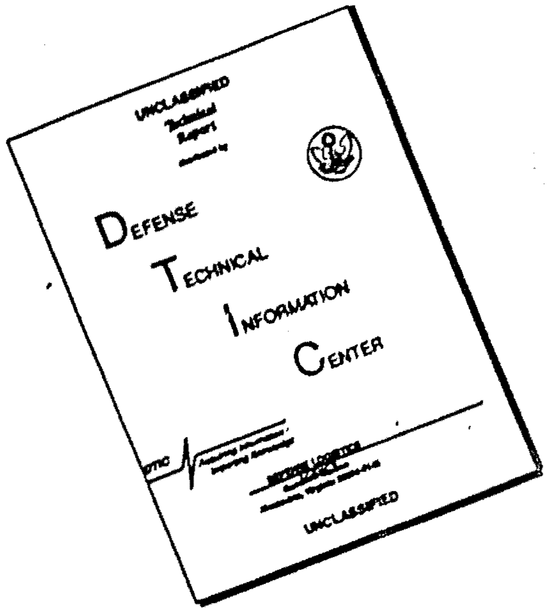


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# Archeological Survey and Reconnaissance Within the Ten-Year Floodpool, Harry S. Truman Dam and Reservoir

PART 1

**Prepared for:**

United States Army Corps of Engineers
Kansas City District
700 Federal Building
Kansas City, Missouri

Contract Number
DACW 41-79-C-0101



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1986

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| Cedar County | Osage River | Late Archaic |
| St. Clair County | archeology | Late Woodland |
| Bates County | survey | |

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This is a report of an archeological survey and recommaissance conducted at the Harry S. Truman Dam and Reservoir Project in southwestern Missouri. The objectives of this study were to inventory archeological resources on 16% of the land between the project's conservation pool and ten-year flood pool and on 40% of the flood easement lands. A total of 180 new sites were recorded.

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## ACKNOWLEDGEMENTS

As is the case with any undertaking of the scope reported here, a large number of people were responsible for the success of the effort. First of all, I would like to thank the residents of the study area for making us feel welcome. Especial thanks are extended to the many landowners who graciously gave their permission for us to enter their lands for survey and collection of artifacts.

The site records check was greatly facilitated by the efforts of Mr. David Evans and members of his staff of the Archaeological Survey of Missouri. Dr. Donna C. Roper, then of the University of Missouri, was of inestimable assistance in the backgrounding effort, making both the records of her investigations and space available for that effort. In addition, I would like to thank Donna for all of her help answering many, many questions.

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Sara Stech, Ronnie Rogers, James O'Hara and Charlotte Smith worked in the laboratory on the analysis of artifacts and other data. Sara served as laboratory director and she is thanked for the efforts she expended in keeping everything organized.

Three people assisted me in the writing of this report. John Cable, assisted by Charles Cantley, conducted the analysis of the lithic assemblages. He also authored that section of the report. Andrea L. Novick analyzed and wrote the section on projectile points, in addition to writing the section on geology and soils in Chapter II. James O'Hara wrote the section on field and laboratory methodology and the site descriptions. He deserves special thanks for accomplishing that very tedious task.

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## ABSTRACT

An archaeological survey and reconnaissance of lands within the Ten-Year Floodpool of the Harry S. Truman Dam and Reservoir was conducted by Commonwealth Associates, Inc., in the summer and fall of 1980. A total of 180 sites was located and recorded. Of these, 132 were located on lands owned by the government and were subjected to intensive survey. The remaining 48 were located on easement lands, or those for which the Corps of Engineers had obtained perpetual flowage easements to permit periodic inundation.

The study area is located in southwestern Missouri near Warsaw, Clinton, and Osceola in the counties of Benton, Hickory, Henry, St. Clair, Bates, Vernon and Cedar. The transition between the eastern deciduous forest and the tall grass prairie occurs in this zone, and it has been the nature of the prehistoric adaptation to these environmental facts that has been the major focus of research for most of the investigators (including this one) who have worked in the area.

A fifteen percent sample of the lands within the Ten-Year Floodpool was the required level of survey effort. For the fee lands, a stratified random sampling strategy was used to choose 113 eighty-acre sample units which were then intensively surveyed. In the easement lands, the constraint against shovel testing made it necessary to choose lands in cultivation. After a reconnaissance to determine the amount of such land, it was determined a random sample was not possible. As a result, it was necessary to choose 46 parcels of land of different sizes in order to survey the necessary sampling fraction.

The resulting sample of sites was evaluated and compared to the results of previous surveys. It was found that our sample is broadly representative of the type and range of prehistoric resources present in the study area. On the basis of this sample and others, it is estimated that the population of sites within the Ten-Year Floodpool is between 900 and 1350 sites.

The major focus of research attempted here is the recognition of large scale geographic patterning of selected properties of the lithic technologies employed in the study area. This was done to evaluate the applicability of Binford's forager-collector model of hunter-gatherer subsistence and settlement (1980). The results reported here are encouraging. There are large scale geographic patterns present in the lithic technologies and they track in the direction suggested by the model.

# I. INTRODUCTION

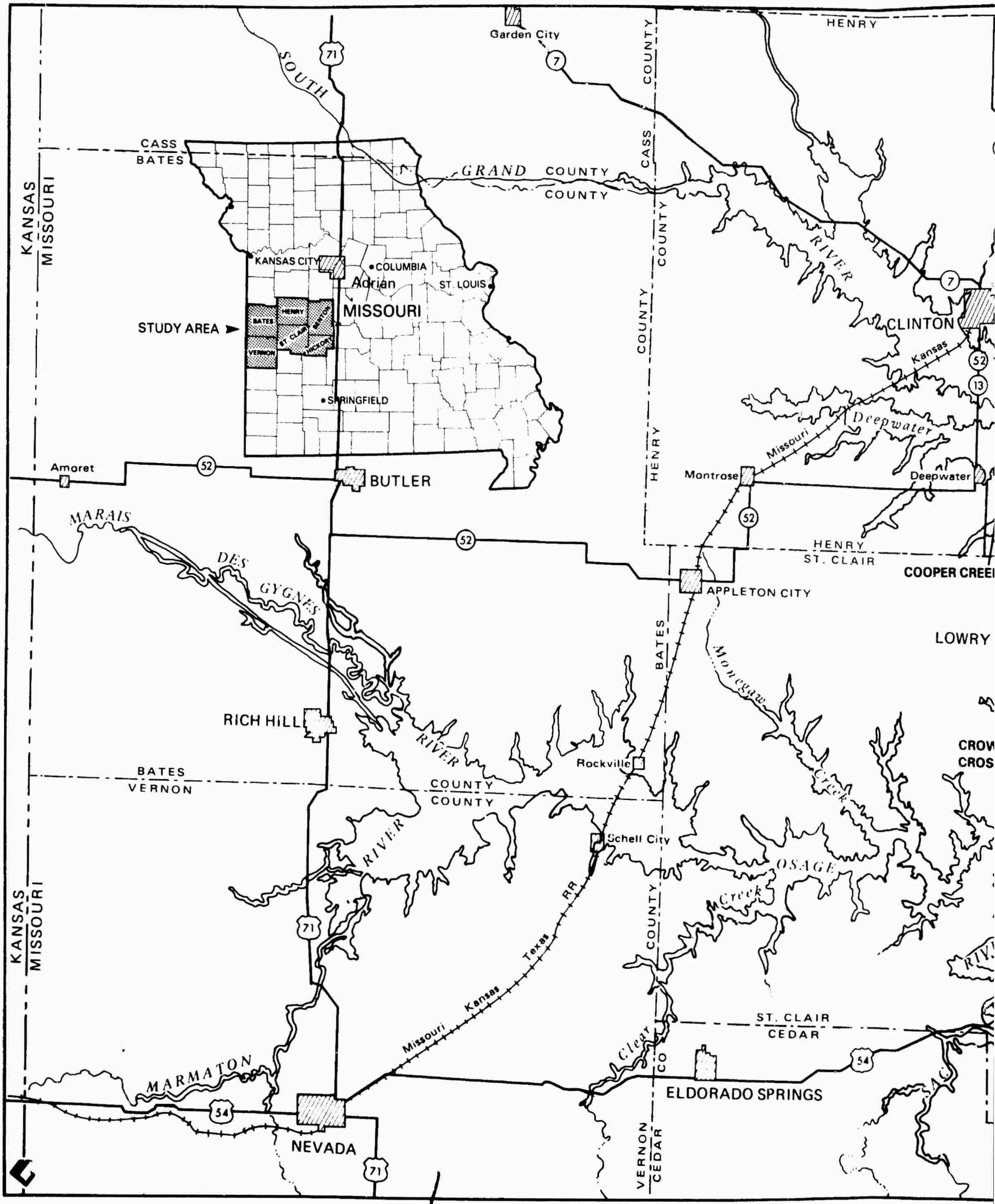
This is the report of an archaeological reconnaissance and survey for prehistoric resources within the Ten-Year Floodpool of the Harry S. Truman Dam and Reservoir located in southwestern Missouri in Benton, Hickory, Cedar, Henry, St. Clair, Bates and Vernon Counties (see Figure 1). This work was conducted by Commonwealth Associates, Inc., of Jackson, Michigan, for the United States Army Corps of Engineers, Kansas City District in accordance with Contract Number DACW41-79-C-0101. A research design was submitted for approval in April of 1980 and after it was approved, field work began in May, 1980 and ended in early August, 1980. A second brief field effort was conducted in November, 1980. Artifact processing and analysis occurred from September, 1980 to April, 1980, and report preparation was concurrent with these activities.

The Ten-Year Floodpool is defined as those lands which lie between 706 feet and 731 above sea level. The 706 foot elevation is the normal level of the conservation pool. As the project is intended to provide flood control for lands downstream, it has been designed so that large volumes of water may be retained periodically behind the dam. The Ten-Year Floodpool, then, denotes the elevation the waters are to reach at least once during a ten-year period.

Some of the land within the Ten-Year Floodpool is owned by the United States Government; the balance remains in private ownership and the government has obtained a perpetual flowage easement for these lands.

This has created two categories of lands. Fee lands are those owned by the government. Easement lands are those which remain in private ownership but for which a perpetual flowage easement has been purchased to permit periodic inundation. These differences in ownership have affected the nature of the archaeological survey reported here. Shovel testing was not permitted in the easement lands and it was necessary to obtain the permissions of land owners in order to survey or collect artifacts. As is detailed below, these facts affected the choice of lands to be surveyed. Also affected was the level of effort. An intensive survey was to be conducted on the fee lands, including shovel testing of vegetated area. A reconnaissance level of survey was to be conducted on the easement lands.

The work reported here is one of many investigations that have been conducted as part of the cultural resource management of the area affected by the construction of the Harry S. Truman Dam and Reservoir. The major research focus was the examination of large scale geographic patterning in the lithic technologies of the prehistoric inhabitants of the region. This was chosen because of the nature of the project (a survey) and also because the lands within the Ten-Year Floodpool cut across the boundary between the deciduous forest to the east and the tall grass prairie to the west.



Garden City
HENRY
SOUTH
CASS
BATES
GRAND COUNTY
COUNTY
CASS COUNTY
KANSAS
MISSOURI
KANSAS CITY
COLUMBIA
Adrian
ST. LOUIS
MISSOURI
STUDY AREA
BATES
HENRY
BENTON
ST CLAIR
VERNON
HICKORY
SPRINGFIELD
RIVER
CLINTON
Kansas
Deepwater
Missouri
HENRY COUNTY
Montrose
Deepwater
Amoret
BUTLER
MARAIS
DES
GYGNES
HENRY
ST. CLAIR
COOPER CREE
APPLETON CITY
LOWRY
BATES
Monegaw
RICH HILL
RIVER
Rockville
CROW
CROS
Creek
BATES
VERNON
COUNTY
COUNTY
RIVER
Schell City
OSAGE
Creek
RR
Texas
Kansas
Missouri
COUNTY
KANSAS
MISSOURI
ST. CLAIR
CEDAR
Clear
CO
MARMATON
ELDORADO SPRINGS
NEVADA
VERNON
CEDAR

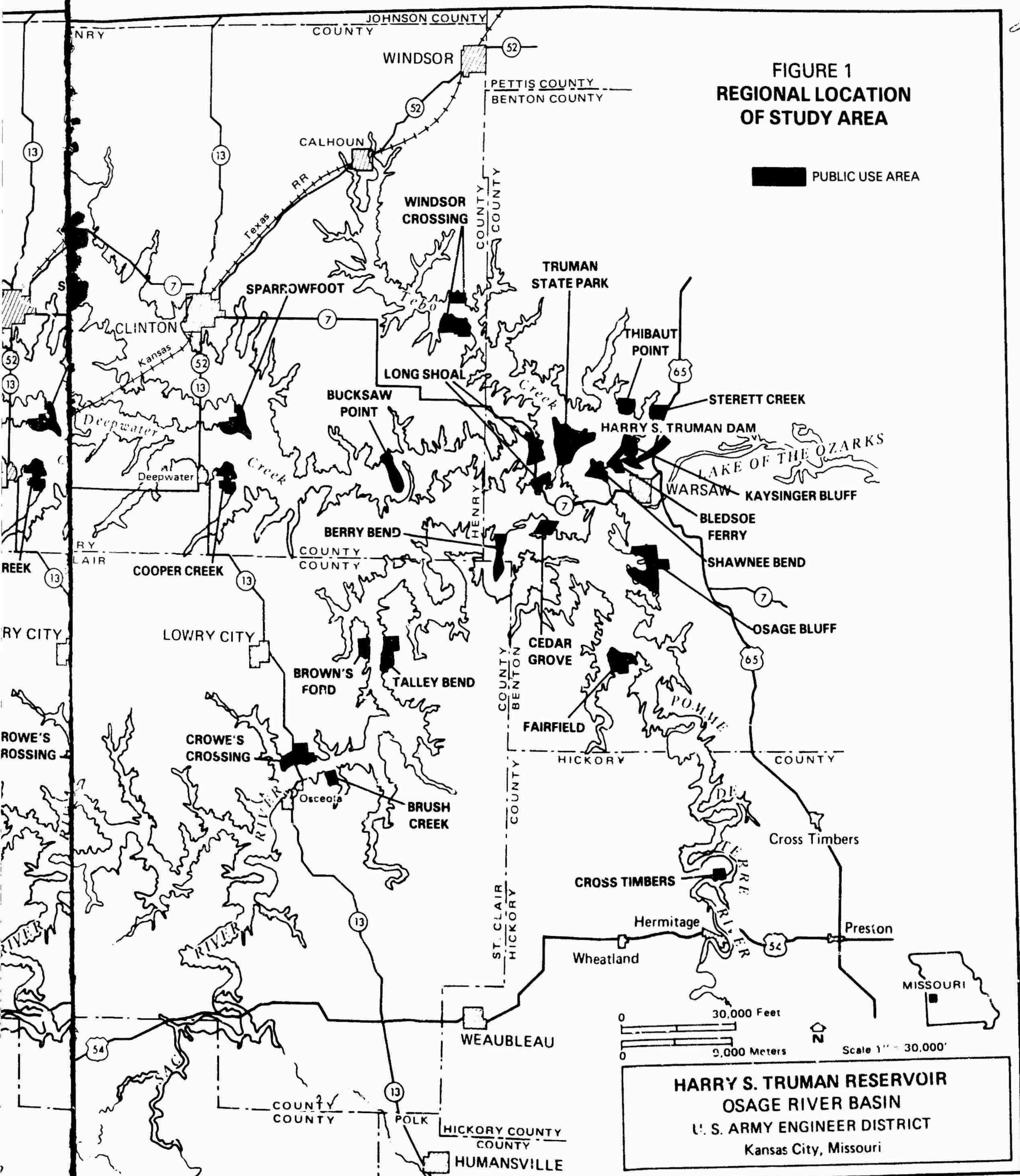


FIGURE 1
REGIONAL LOCATION
OF STUDY AREA
PUBLIC USE AREA
JOHNSON COUNTY
COUNTY
WINDSOR
PETTIS COUNTY
BENTON COUNTY
CALHOUN
Texas RR
WINDSOR
CROSSING
COUNTY
COUNTY
TRUMAN
STATE PARK
SPARROWFOOT
CLINTON
Kansas
Tebo
THIBAUT
POINT
LONG SHOAL
BUCKSAW
POINT
Creek
STERETT CREEK
HARRY S. TRUMAN DAM
LAKE OF THE OZARKS
Deepwater
Deepwater
Creek
WARSAW
KAYSINGER BLUFF
BLEDSOE
FERRY
BERRY BEND
HENRY
COUNTY
COUNTY
SHAWNEE BEND
REEK
COOPER CREEK
OSAGE BLUFF
RY CITY
LOWRY CITY
CEDAR
GROVE
BROWN'S
FORD
TALLEY BEND
COUNTY
BENTON
FAIRFIELD
POMME
ROWE'S
ROSSING
CROWE'S
CROSSING
HICKORY
COUNTY
Osceola
BRUSH
CREEK
COUNTY
RIVER
DE
Cross Timbers
CROSS TIMBERS
TERRE
ST. CLAIR
HICKORY
Hermitage
RIVER
Preston
Wheatland
RIVER
RIVER
MISSOURI
30,000 Feet
9,000 Meters
N
Scale 1" = 30,000'
WEAUBLEAU
COUNTY
COUNTY
POLK
HICKORY COUNTY
COUNTY
HUMANSVILLE
HARRY S. TRUMAN RESERVOIR
OSAGE RIVER BASIN
U. S. ARMY ENGINEER DISTRICT
Kansas City, Missouri

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## II. DESCRIPTION OF THE STUDY AREA

In this chapter, various aspects of the setting of the study area will be discussed. Most of the information which will be presented has been offered elsewhere in conjunction with previous reports of investigations conducted in or near the study area (McMillan 1976, Roper 1977, Iroquois Research Institute 1980). Our purpose here will not be to reinvent the wheel in the presentation of this information. Rather it is to provide for the reader all of the relevant information needed to assess the conduct and results of the study within a single volume. A second purpose for the discussion will be to "set the stage" for later sections of this report, namely, the research design that has guided the conduct of the study. Reviewing the literature about the study area and the region, it is evident that most authors place heavy emphasis on the fact that the study area is on the prairie-forest border and that the dynamics of vegetational changes during the Holocene have meant that the prehistoric peoples of this area had to cope with radically different environmental settings. Curiously, however, this emphasis does not appear to have been carried through to the analysis and interpretation of the archeological record and what it means in terms of the strategic choices faced by people attempting to adapt to these changing situations. Rather, analysis and interpretation appear to take the form of simple correlations between climatic/environmental change and evidence for cultural change. It is as if the demonstration of the correlation constitutes explanation. It is our belief that there is more to it than that. In order to appreciate fully the nature of the prehistoric adaptations of this area, it will be necessary to adopt what might be referred to as a "strategic" approach. What are the strategies employed by the prehistoric inhabitants of this area to effect an adaptation to the different environments of the Holocene? What can these strategies, once explained, tell us about the suitability or desirability of different environments as settings for human adaptations. Did the prehistoric inhabitants of the study area prefer the forest or the prairie? Or did they prefer the prairie-forest border? In keeping with this approach, the following sections will be oriented towards the presentation of information relevant to these considerations.

### GEOLOGICAL BACKGROUND

#### Introduction

Geology plays a fundamental role in archeological studies because it structured the environment in which prehistoric peoples interacted. Bedrock geology influences the structure of soils, drainage patterns, geomorphology, and vegetation, which in turn affect prehistoric utilization, exploitation strategies and human organization regarding vital resources. Some site types, rock shelters for example, are related directly to bedrock types. Availability of lithic materials and minerals is also directly related to bedrock exposures.

Soil studies have aided archeological studies in many ways. For example, soils in the study area reflect the prairie/forest transition zone, relating to both vegetation and bedrock geology. Several studies (Duffield 1970; Dekker and DeWeerd 1973) have demonstrated that relationships between different archeological sites and soils exist, and in some cases may even be predicted.

With these ideas in mind, it is hoped that the following section will not only present information on geology and soils, but integrate it with prehistoric adaptations in southwestern Missouri.

**Bedrock Geology**

A short summary of the study area's geology is presented below (Table 1, Figure 2). A more thorough statement on Missouri's geologic history may be found in Branson's (1944) treatise. Shorter summaries specifically for the reservoir area are presented by Allen, Ward and Roth (1975) and Ward and Thompson (1977).

The Truman Reservoir area has a rich paleontological history, particularly with regard to Late Pleistocene megafauna. Current research along the Pomme de Terre has been reported by Saunders (1975) and an extensive bibliography is available in McMillan (1976).

Anderson's (1979) Geologic Map of Missouri vividly illustrates the state's geologic features. The dominant structure is the Ozark Dome, centered south of the present day city of St. Louis. Precambrian rocks, the only major occurrence in the state, compose the dome's core. Rings of progressively younger strata, Cambrian, Ordovician, etc., surround this core. As the dome was eroded, youngest rocks weathered first, and as time passed older rocks were exposed, until the Precambrian core appeared. As one progresses westward, away from the dome's core, rocks dip gently to the northwest. The general trend of exposed dome strata is found throughout southeastern Missouri, south of the Missouri River, in what has been defined geomorphologically as the Salem Plateau (Bretz 1965; Fenneman 1938). However, older rocks are exposed in downcut drainages, such as Lake of the Ozarks. Along the Osage River just west of Warsaw, Missouri (the dam site), Ordovician strata are overlain by later Mississippian and Pennsylvanian rocks, which outcrop through much of the study area. Although Mississippian and Pennsylvanian strata dominate older rocks, the Ordovician St. Peter sandstone, as well as other formations, are exposed in the Osage River and tributary drainages. Rocks ranging in age from Precambrian through Mississippian compose the geological sequence in the project area. However, only those rock strata useful for making stone tools and providing shelter for the prehistoric inhabitants of the region will be discussed below.

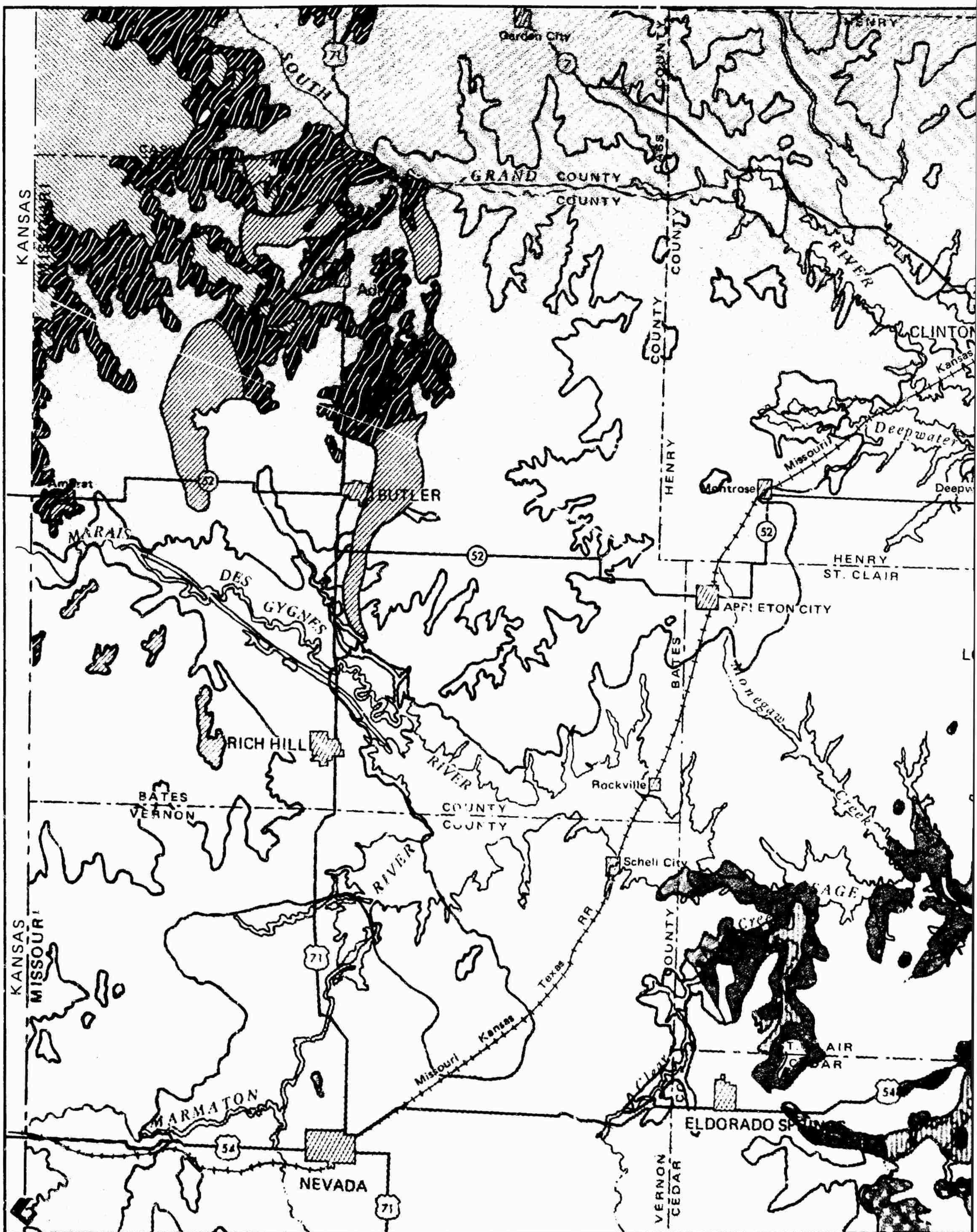
Ordovician strata include the Gasconade, Jefferson City, Cotter, and Powell dolomites and the St. Peter sandstone. The Gasconade dolomite, outcrops in bands and as bluffs along the Osage, Niangua and Gasconade rivers (Branson 1944:41). Availability of chert within the formation varies. Chert present in the Gasconade varies from white, to buff and gray (Branson 1944:42-43), to black (Ward and Thompson 1977:8).

The Jefferson City formation occurs frequently in the reservoir area. The formation is dominated by dolomite with lesser amounts of sandstone, limestone, and greenshale. Chert nodules are available throughout the formation. Klippel (1971:59) observed that fossils were sparse in Jefferson City cherts, but that oolites and banding were common characteristics.

## TABLE 1

## STRATIGRAPHIC RELATIONSHIPS OF ARCHEOLOGICALLY IMPORTANT ROCK STRATA

| Age | Map Key | Formation Name |
|---|---|---|
| Recent | | Alluvium |
| Quaternary | | Alluvium |
| | | Loess |
| Pennsylvanian | | Krebs Subgroup |
| | Pck | Riverton Formation |
| | | Cherokee Group |
| Mississippian | Mo | Burlington Limestone |
| | | Northview Formation - Sandstone |
| | Mk | Compton Limestone |
| | | Chouteau Formation - Limestone |
| Ordovician | Osp | St. Peter Sandstone |
| | Ojc | Powell Formation - Dolomite |
| | | Cotter Formation - Dolomite |
| | | Jefferson City Dolomite |
| | Or | Roubidoux Formation |
| | Og | Gasconade Dolomite |
| Cambrian | | |
| Precambrian | | |


Garden City
SOUTH
GRAND
COUNTY
COUNTY
CASS COUNTY
HENRY COUNTY
RIVER
CLINTON
Kansas
Deepwater
Missouri
Montrose
KANSAS
MISSOURI
BUTLER
MARAIS
DES
GYGNES
RIVER
HENRY
ST. CLAIR
APPLETON CITY
BATES
Monegaw
Creek
RICH HILL
Rockville
BATES
VERNON
COUNTY
COUNTY
Schell City
OSAGE
RIVER
Texas
RR
Kansas
Missouri
Clear
ST. CLAIR
CEDAR
MARMATON
ELDORADO SPRINGS
NEVADA
VERNON
CEDAR

1

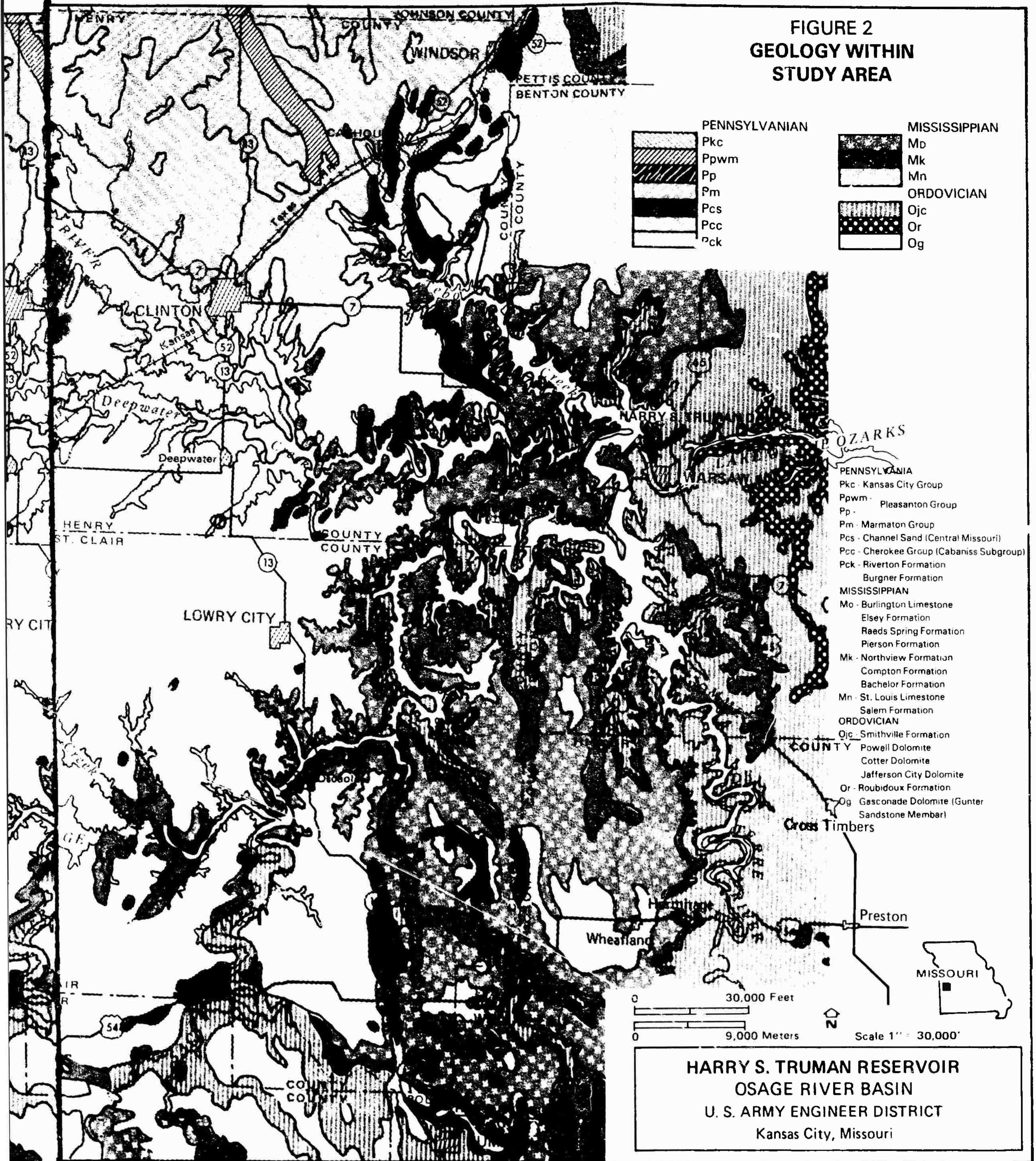


FIGURE 2
GEOLOGY WITHIN STUDY AREA

The Cotter and Powell formations are quite similar, and are distinguished on the basis of fossil evidence or unconformities. A white to light brownish dolomite is the dominant feature of the formation accompanied by lenses of sandstone and white, oolitic chert. In some areas the Cotter, Powell, and Jefferson City formations are grouped together, however, in southwestern Missouri differentiations are made.

The final, important member of Ordovician age in the region is the St. Peter sandstone. Unlike previously discussed formations, the St. Peter has a wide distribution throughout the midwestern states (Branson 1944:64). It is found as far north as Minnesota where it is well known as an aquifer, and ranges from as far west as Oklahoma and Kansas to Ohio on the east. This formation is a pure quartz sandstone which varies in thickness from 30 to 150 feet. Cross-bedding and ripple marking are found in the formation, however, a marine versus a subaerial origin is still debated.

Common formations of Lower Mississippian age include the Chouteau, Compton and Northview. The Chouteau was named in 1855 for outcrops occurring in Cooper County, south of the Missouri River, near Chouteau Springs. It is a thinly bedded, gray limestone, with minor amounts of dolomite, sandstone, and shale. Thickness varies from 20 to 60 feet. Branson (1944:191-192) notes the presence of chert throughout the formation, particularly "a band of dark-colored chert nodules six inches thick near the bottom." Ward and Thompson (1977:9) also note the occurrence of "a distinct blue-black nodular chert, with prominent white rinds, that was used for flint tools in the past," within the Chouteau.

The Compton limestone was named for outcrops east of Springfield in Webster County, along the James River. It is a bluish colored limestone, ranging in thickness from 10 to 20 feet. Unlike the Chouteau, chert is not present.

The Northview sandstone outcrops continuously from Benton County south to Barry County on the Arkansas state line. The formation is composed of a yellow sandstone that may attain a thickness of 25 feet, and a gray to olive shale, that ranges in thickness from 25 to 80 feet. The sandstone is very resistant, often forming benches, terraces, or buttes (Branson 1944:194). Shales and argillaceous silt-stones compose the lower member of the formation. These vary in hardness, and, upon weathering, a clay mud often forms. Nodular masses of iron pyrites occur in this section of the formation. The Northview formation is common in the western portion of the reservoir area, particularly in St. Clair County.

The most important Middle Mississippian formation is the Burlington limestone, named for outcrops near Burlington, Iowa. One of the most outstanding features of the limestone is the presence of fossil crinoid stems and plates. Color is gray, and thickness ranges to 90 feet. Chert occurs throughout the formation (Branson 1944:229) ranging in color from white to light gray, to bluish gray. It forms as both bands and nodules. Klippel (1971:59) observed the chert to be fossiliferous and mottled with a brown interior color.

The Cherokee Group, which is Lower Pennsylvanian in age, is the most common from this period. Cherts are common in the earlier Ordovician and Mississippian formations (Branson 1944:270). The Cherokee group was named for



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outcrops that occur along the Neosho River in Kansas. Thickness of the formation varies from 75 to 700 feet. The formation may be characterized as interspersed beds of coal, shale, limestone, sandstone, and clay.

With respect to the bedrock geology, several important archeological facts may be discussed. As noted above, the bedrock geology is directly responsible for the formation of a specific archeological site type, the rock shelter. Perhaps one of the most well known sites in the reservoir area is Rodgers Shelter (McMillan 1971; Wood and McMillan 1976). This rock shelter was formed by the partial weathering of Ordovician dolomite along the Pomme de Terre. North of this site, along the Pomme de Terre, Chomko (1977:70-154) reported on excavations at 23HI246, a small unnamed shelter and 23HI247, Beck Shelter. Both occur as the result of weathering of Mississippian limestone (Chomko 1977:70, 85). The one rock shelter discovered during this survey, 23BE1027, located farther north in the study area, along Hogles Creek, is also found in limestone. Assemblages recovered from limestone shelters pose a unique problem because they often need to be washed with dilute hydrochloric acid (e.g., Chomko 1977:8) to remove lime deposits. Cherts occur within both of these limestone and dolomite formations. In the western portion of the reservoir area, rock shelters occur within the Northview formation. For example, Novick and Cantley (1977), reporting on six small rock shelters in St. Clair County, note that all were found in the yellow, Northview formation, and at some sites, contact with the lower shale and siltstone member was observed. Of course, in these instances, the soil is dominated by weathering sandstone and artifacts may be treated in the usual way.

The differences in the type of stone forming the rock shelters is also reflected in the assemblages. At Rodgers Shelter, chipped stone tools of chert are common, while some ground stone tools including hammerstones, anvils, manos, and whetstones (Ahler and McMillan 1976:182-189) were made of dolomite and others were made of exotic materials. An engraved dolomite tablet was also found at the site. Chomko's (1977) excavations revealed the presence of limestone hearth stones. At the sandstone shelters (Novick and Cantley 1977), hearth stones were made of sandstone, as were nutting stones, manos, metates, and abraders, thus indicating the expedient use of locally occurring raw materials in all of the shelters.

Throughout the reservoir area, chert was used to make chipped stone tools. It is available as cobbles and nodules as well as tabular outcrops in Mississippian and Ordovician strata. Stream beds throughout the region are filled with chert cobbles as are soils and alluvial fills. Because the chert is found in all drainages, determining a quarry area may be problematic, although distinguishing features that may relate cherts specific to formations can be noted (Klippel 1971: Appendix 1). In other words, there are criteria by which cherts can be assigned to a specific formation, but it is difficult to suggest that prehistoric peoples obtained chert from individual outcrops, simply because of its ubiquity in drainages. A better argument could be made for source areas for ground stone tools made of local materials including dolomite, limestone, and sandstone.

### Surficial Geology

A short summary of the surficial geology or geomorphology of the reservoir area is presented below. For a more detailed account, the interested reader is

referred Sauer (1920), Fenneman (1938), Branson (1944:336-357), and Bretz (1965). In the study area specifically, Haynes (1976, 1977) has investigated depositional history in portions of the Pomme de Terre. Broad regional summaries of geomorphological development may be found in Fenneman (1938:631-662) and Bretz (1965).

The oldest feature in the region is the granitic core rock of the Ozark Dome which is known as the St. Francois Mountains. It is interpreted as representing a pre-Paleozoic episode of uplift and erosion, resulting in the only remaining feature, the mountains. The next oldest feature in the area is the Boston Mountains. During the Tertiary another episode of erosion ensued, effectively peneplaining the region surrounding these mountains. Another uplift occurred centered to the south, in present day Arkansas, in the Ouachita Mountains. Erosion of this fresh ground surface is known as the Ozark Cycle (Bretz 1965:36). Rivers began to follow paths of least resistance, flowing down the steeper slopes of the uplifted area. The resulting surface is referred to as the Ozark Peneplain. Subdivisions within this cycle include the easternmost Salem Plateau that correlates well with the western boundary of Ordovician strata in the state. The southwestern portion of the state, underlain by Mississippian and later age strata, is known as the Springfield Plateau. One final episode of slight uplift occurred followed by further erosion of the Ozark Peneplain. Major drainages developed during this time resulting in what Fenneman (1938) described as gorge cutting and a few drainages that had formed during previous periods widened their channels and meanders. It should be stressed that these events reflect a dynamic geomorphological history in the region with at least three major changes in land surfaces and drainages.

Although certain drainages formed during the later cycles, of interest here is the formation of the Osage River and its tributaries, occurring thousands of years prior to prehistoric occupation of the area. Formation of streams and rivers during pre-Ozark periods often correlated with local structural geology. However, some drainages formed with little or no relation to such bedrock conditions. Fenneman (1938:641-642) argues that the Osage River is a prime example of such a drainage pattern. The Osage River flows south of the Osage-Missouri Divide (Bretz 1965:48-54), the Ozark peneplain, through the study area as indicated on the Cole Camp Lincoln NW, USGS 7.5' Quadrangles, then swings northwest just east of Tebo Creek. Although the divide is considered a peneplained surface, as it crosses the Salem and Springfield Plateaus, it experiences elevation changes ranging from 1100 to 800 feet msl. Some portions of the Osage River valley floor which is contemporaneous with the Ozark peneplain event, are retained as remnants ranging from between 840 to 960 feet msl (Bretz 1965:93-94). In the study area, Ozark peneplain remnants are visible in eastern St. Clair County (USGS 7.5' Iconium and Valhalla Quadrangles). In sections, the present day channel of the Osage River has cut its channel well below the level at which it flowed during the Ozark peneplain stage. Fenneman (1938:642) notes that the gradient of the White River, which flows along the southern edge of the Ozark Plateau is about two and one-half feet per mile; while the Osage River has a gradient of approximately one foot per mile. This is interesting because along the Osage River's course, during periods of uplift, tilting occurred in the downstream direction. That is, as the route of the river is examined upstream (westward) the peneplain descends in the same direction. So as the river flows downstream (easterly) it crosses this westerly dipping peneplain. Bretz (1965:94, 106) argues that the well developed, entrenched meanders of the Osage River date to an erosional episode transpiring after the Ozark peneplain. In the study area, the

Osage River's dramatic gorge quality is best illustrated at the confluence of the Osage and the Sac just west of Osceola in St. Clair County. As Bretz (1965:94) notes:

> Traced upstream, westward, the gorgelike character of the inner valley decreases until it vanishes in St. Clair County. Farther upstream, the wide, shallow, flat bottomed valley has abundant active meanders, crescentic lakes, and deferred tributary junctions in striking contrast with the Lake of the Ozarks stretch.

Unlike the more dynamic eastern portions of the Osage River, its major tributaries, such as the South Grand are more similar to the western, upper reaches of the Osage. These valley floors retain the same character as they did during uplift after the Ozark peneplain stage. While meanders have broadened valleys over time, there has been relatively no downcutting below original base levels attained during the post-Ozark period. Similarly, smaller tributaries and drainages exhibit little or no downcutting. In fact, in Vernon and Bates Counties at the extreme western edge of the Truman study area, alluviation has aggregated the drainages (Bretz 1965:107). With respect to downcutting, small tributaries are not in great abundance except in the eastern part of the Ozark peneplain in Henry and St. Clair Counties. Here, even some of the lesser tributaries are present as ravine valleys. It is in this region of old valley ravines that many small, sandstone rock shelters occur in St. Clair County (Novick and Cantley 1977).

The previous discussion has focused on rather broad interpretations of regional geomorphology (Bretz 1965; Fenneman 1938). Haynes' (1981) and Brakenridge's (1980) recent summaries of geomorphological investigations in the reservoir area, conducted during the University of Missouri's 1976, 1977, and 1978 field seasons, provide a much more refined sequence of events than previously available (Haynes 1976, 1977). The original terrace sequence described by Haynes has been refined, supplemented with additional radiocarbon dates, and applied to other regions of the reservoir area (Joyer and Roper 1980; Roper 1981a; Joyer 1981). Comparisons of portions of the Pomme de Terre sequence with sediments in other drainages in the study locality is based on interpretations of sources for depositional material. It has been proposed that these similarities are related to loess erosion (Haynes 1981). Loess was deposited in highland areas and subsequently eroded more readily than some of the local bedrocks and parent soils. Consequently, alluvial materials reflect a similar loess deposited throughout the region, rather than differing local geological settings within the region, as might be expected.

Although the reservoir area is south of the glacial margin, episodes of erosion and deposition have suggested correlates with various Pleistocene events (Haynes 1981). However, interpretation of these correlations (Haynes 1981; Brakenridge 1980) vary. Brakenridge (1980) has argued that some erosional and depositional episodes in the Pomme de Terre may be compared with major drainages in similar latitudes and be related more to atmospheric circulation and paleoclimatic factors.

While the exact causes and explanations for erosional and depositional episodes in the Pomme de Terre valley are debated, correlations of these strata, e.g., the Rodgers alluvium, throughout the project area maintains important

possibilities with regard to archeological site patterning and discovery. As Roper (1981c) has suggested, the potential for recovery of early sites (Paleo-Indian) may be related to burial or erosion within river valleys. For example, over the past 11,000 years (Brakenridge 1980) the floodplain level of the Pomme de Terre has experienced five major changes. It is possible that the more eastern reaches of the Osage, South Grand, etc., have similar dynamic histories. If this is true, the likelihood of finding early sites may be considerably reduced. Virtually no detailed information is available for the extreme western reaches of the drainages in Bates and Vernon Counties. However, based on Bretz's (1965) work, it would seem that if Paleo-Indian sites are in the region they would be buried by the aggrading waterways, or eroded by lateral movement and meanders. It should be stressed here that these interpretations are speculative.

**Soils**

A generalized discussion of Missouri soils may be found in Scrivner, Baker, and Miller (1975). Unfortunately, in the reservoir area recent USDA Soil Conservation Service soil surveys are only available for Henry (Grogger and Persinger 1976) and Vernon (Preston 1977) Counties. The most detailed soil studies have been conducted by Donald L. Johnson (1977, 1981). Johnson's (1977) research focused on portions of the Pomme de Terre valley, supplemented by a sampling of soils at archeological sites in other regions of the reservoir (Johnson et al. 1981).

As noted in the introduction to this section, relationships between soils, bedrock geology, and vegetation are interrelated. Soil has been defined as "a natural body of mineral and organic matter which changes or has changed in response to climate and organisms" (Buol, Hole, and McCracken 1973:8). Soils are described by horizons or layers defined on the basis of such characteristics as chemical composition, moisture, organic content, and texture. A typical soil profile may include several horizons beginning on the surface with an O, decomposing leaves; an A, a zone of eluviation exhibiting leached minerals, concentrations of silica, and decomposed organic material; a B, a zone of illuviation where minerals concentrate along with clay; and a C, which is the parent material from which the soil is formed (Foth and Turk 1972:204-206).

A variety of factors including slope, direction, altitude, and climate influence soil development. A toposequence or soil catena is a series of soils that are grouped together on the basis of topographic relationships. Soils in a toposequence may range from those covering hills, extending down slopes, and ending in valleys. Relationships between slope, drainage, and parent material are particularly important in these situations. An example is the Hartwell-Deepwater association in Henry County (Grogger and Persinger 1976:2-3, Figure 2), the most common group composing 40 percent of the county's soil. Hartwell soils are found on hilltops, Deepwater soils occur on slopes and ridges at lower e'evations, while a variety of other types may form on bedrock.

Within the project area soils, may be broken into two categories, prairie and prairie-forest transition natural vegetation and forest natural vegetation (Scrivner et al. 1975:4). Forest soil associations in the eastern section include the Bolivar-Mandeville, which is low in fertility and formed on micaceous shale; Lebanon-Nixa-Clarksville and Hobson-Clarksville, which is low in fertility and developed on

cherty dolomites, limestones, and sandstone; and Clarksville-Fullerton-Talbott, a high quality soil that forms on cherty dolomite and limestone. This last soil is common along the Osage River, along the steep slopes. High elevation Clarksville soils are characteristically cherty, with the Fullerton and valley Talbott soils having less chert. Prairie and prairie-forest transition soils to the west include the Gerald-Craig-Eldon and Newtonia-Baxter associations, which have developed on loess and cherty limestone; the Parsons-Dennis-Bates association formed on acidic, micaceous shale, sandstone and loess; and the Summit-Newtonia-Parsons-Dennis association occurring on shale, limestone, and loess. Few of these soils are high in fertility, although a number have moderate ratings. Many are forested while others serve as cropland, pasture, or forage areas.

More detailed soil descriptions are found in Grogger and Persinger's (1976) survey of Henry County, which is situated on the prairie-forest soil transition. As noted earlier, the loess derived Hartwell and Deepwater soils dominate the county. The Hartwell silt loam is formed from loess, silt, and shale, and occurs on level to gently sloping uplands (Grogger and Persinger 1976:20-22). This silt loam is easily eroded, often wet in spring, and dry in summer. Deepwater silt loams are quite similar, having loess capped shale as a parent material with prairie grass as the native vegetation. Both soils may reach depths of six feet. The Verdigris-Osage association, deep, moderately well to poorly drained, has formed on alluvium in the South Grand River, as well as branches and tributaries of Tebo and Deepwater Creeks. The Verdigris silt loam is high in fertility, has a native lowland deciduous forest cover, but is often flooded. Osage silty clay loam is found in valley bottoms between bluff walls and the Verdigris silt loam bordering the waterways. Several other associations are found adjacent to the Verdigris-Osage, with their major distinguishing characteristic being derivation from local bedrock formations rather than from alluvial origins.

## VEGETATION OF THE STUDY AREA

The Truman Reservoir area lies on the boundary between the oak-hickory forest of the Ozark Plateau and the tall-grass prairies of the Western Prairie region. The resulting distribution of vegetation is complex, much more so than in either the forest or the prairie. It is very likely that the position of the study area in the transition zone between these major biotic zones strongly conditioned the character of prehistoric adaptations. The importance of the role of the vegetation and its distribution has, of course, been known to other researchers, and as a result, a number of excellent studies of various aspects of the vegetation are available. These include the study of the Pomme de Terre locality by McMillan (1976a), and of the Truman Reservoir area as a whole by King (1978). In addition, King (1976a, 1976b) has prepared a list of potential food plants of the Western Missouri Ozarks and an estimate of forest density and nut production potential for the area around Rodgers Shelter. The ensuing discussion will rely heavily on King (1978) due to its reservoir-wide scope and especially because of its emphasis on a number of variables which influence the distribution of vegetation. King's discussion is also valuable in that it is exploitation-oriented, that is, it focuses on those factors affecting the procurement of plant foods such as abundance, storability, and seasons of availability.

The study area occurs in the western portion of the oak-hickory forest region which is a part of the much larger eastern deciduous forest (Braun 1950). This forest is considered to be best developed in the interior highlands, the Ozark and Ouachita Mountains. There are two principal divisions of this forest region, the northern one, which occurs on glaciated terrain and is of no concern to us here, and the southern division, whose northern boundary is considered to be the Missouri River. Within this division, there are two sections, the Interior Highland section and the forest-prairie transition section. The study area straddles these two sections.

Principal species of the oak-hickory forest include the white oak (Quercus alba), post oak (Q. stellata), black oak (Q. velutina), blackjack oak (Q. marilandica), bitternut hickory (Carya cordiformis), mockernut hickory (C. tomentosa), pignut hickory (C. glabra), and shagbark hickory (C. orata). Other species associated with these include walnut (Juglans spp.), elm (Ulmus spp.), ash (Fraxinus spp.), and maple (Acer spp.), among others. Dogwood (Cornus florida) and redbud (Cercis canadensis) are important understory species. The nature of the various species associations in any given place is affected by the topography, soils, slope and moisture. White oaks favor more mesic situations, while post oaks occur in more xeric settings. This is reflected in the forest-prairie transition section where post oak and blackjack oak are the dominant trees of the upland forests; white oaks, favor north facing slopes in this section.

McMillan (1976a) and King (1978) employed records of the Government Land Office to reconstruct the presettlement forests of different parts of the study area. These records include witness tree descriptions every quarter-section and section, in addition to a number of other categories of information which are presented in tabular form by McMillan (1976a:24). Mathematical techniques have been developed which use this information to map the distribution of vegetation at the time of survey (King 1978:6-9). McMillan (1976a) used these records to reconstruct the distribution of vegetation in a 15 km by 18 km area centered on Rodgers Shelter. His purpose was to assess the amount of diversity present in the area around the shelter, providing a basis for inference about the importance of Rodgers Shelter in the subsistence-settlement systems of the area. Five vegetation zones were delineated: upland prairie, bottomland prairie, oak barrens, oak-hickory forest and bottomland forest (see Table 2). As these are representative of the major kinds of vegetation communities present in the study area, they are discussed below.

**Upland Prairie**

Very little information about the species composition of prairies is known from the Government Land Office surveys because the surveyors were not instructed to note any specific plants, but only the limits of any prairies encountered (McMillan 1976a:25-26). According to Kucera (1961:226), the principal species of the prairie association include big bluestem (Andropogon gerardi), little bluestem (A. scoparius), Indian grass, (Sorghastrum nutans), wild rye (Elymus canadensis), Junegrass (Koelaria cristata), dropseed (Sporobolus heterolipis), side-oats grama (Boutelona curtipendula), switchgrass (Panicum virgatum) and slough-grass (Spartina pectinata). The segments of prairie mapped by McMillan are an outlier of the Prairie Peninsula (Transeau 1935).

## TABLE 2

## PRIMARY PLANT RESOURCES OF THE TRUMAN RESERVOIR

| Species | Habitat | Western Missouri Ozarks | Eastern Kansas |
|---|---|---|---|
| *Acer* spp. (Maple) | Bottomland forest | 4 spp. | 3 spp. |
| *Allium* spp. (Wild onion) | Bottomland forest | 3 spp. | 2 spp. |
| *Amelanchier arborea* (Shadbush) | Oak-hickory forest, bluffs | X | X |
| *Amphicarpa bracteata* (Hog peanuts) | Bottomland | X | X |
| *Apios americana* (Ground nut) | Thickets, bottomland | X | X |
| *Asclepias* spp. (Milkweed) | Bottomland, prairie, barrens | 3 spp. | 3 spp. |
| *Asimina triloba* (Paw paw) | Bottomland | X | X |
| *Carya* spp. (Hickory) | Bottomland, oak-hickory forest | 7 spp. | 4 spp. |
| *Corylus americana* (Hazelnut) | Bottomland, barrens, oak-hickory forest | X | X |

TABLE 2 (Continued)

| Species | Habitat | Western Missouri Ozarks | Eastern Kansas |
| --- | --- | --- | --- |
| Diospyros virginiana (Persimmon) | Glades, bottomland, barrens | X | X |
| Fragaria spp. (Strawberry) | Prairie, oak-hickory forest, barrens | X | X |
| Helianthus annus (Sunflower) | Prairie, disturbed ground | 0 | X |
| H. tuberosus (Jerusalem ashchoke) | Bottomland prairie | X | X |
| Juglans nigra (Black walnut) | Bottomland, oak-hickory forest | X | X |
| Malus pyris ioensis (Wild crabapple) | Bottomland, oak-hickory forest | X | |
| Nelumbo lutea (American lotus) | Ponds, ox-bow lakes | X | X |
| Physalis spp. | Forest, prairie | 6 spp. | 6 spp. |
| Prunus spp. (Wild cherry plum) | Forest | 7 spp. | 6 spp. |
| Psoralea esculenta (Prairie turnip) | Prairie | 0 | X |

TABLE 2 (Continued)

| Species | Habitat | Western Missouri Ozarks | Eastern Kansas |
|---|---|---|---|
| Quercus spp. (Oak) | Forest | 7 spp. | 7 spp. |
| Ribes spp. (Gooseberries, Currants) | Bluffs, barrens, forest border | 2 spp. | 2 spp. |
| Rubus spp. (Raspberries, blackberries, dewberries) | Forest, prairie, thickets | 7 spp. | 5 spp. |
| Sagettaria latifolia (Duck potato) | Ponds, slow streams | X | X |
| Sambucus canadensis (Elderberry) | Open woods, bottomlands | X | X |
| Vitis spp. (Grape) | Forest | 4 spp. | 4 spp. |

NOTE: From King 1978; X indicates presence of species)

### Bottomland Prairie

This vegetation type occurred in one area known to contain wet marshes or bogs (McMillan 1976a:27). As mentioned above, species composition of this vegetation zone was not noted by the government surveyors. Some information about species composition is available from Weaver (1954) and Weaver and Fitzpatrick (1934) cited by King (1978). Species composition in the prairie is dependent on soil moisture. Sloughgrass (Spartina pectinata) and reed canary grass (Phalaris arundinacea) occur on the wettest, most poorly drained soils (King 1978:53). Switchgrass (Panicum virgatum) and wild rye (Elymus canadensis) occur in drier portions of the bottomland prairie. Although not encountered by McMillan in his reconstruction, bottomland prairie can occur in the broader, well-drained portions of the larger tributaries. In these settings, big bluestem (A. gerardi) and Indian grass (Sorghastrum nutans) are common.

### Oak Barrens

This vegetation zone can be characterized as primarily a grassland containing a few scattered trees and brush (McMillan 1976a:29). In the area mapped by McMillan, this type occurred in hilly country flanking either the oak-hickory forest or bounding the floodplain forest. The major species of this zone are the post oak and black oak. White oak, blackjack oak and black hickory (C. texana) are a minor component (McMillan 1976a:29, Table 2.4). The density of trees in this zone varies with aspect, or the direction in which a land surface faces (King 1978:1). Trees were denser on north slopes; in some areas, the north slope of a valley would be wooded, while the south slope was covered with grass (McMillan 1976a:29). There was also a substantial amount of herbaceous vegetation in this zone. Descriptions of the lines surveyed examined by McMillan (1976a:29) mention sumac, hazel, grape, rose and strawberry. Oak sprouts and saplings are also part of this vegetation zone. King (1978:16) has estimated the tree density for the barrens to be approximately one tree per acre.

### Oak-Hickory Forest

The principal species of this zone are post oak and black oak, with lesser amounts of white oak and blackjack oak present (McMillan 1976a:30). In the area mapped by McMillan, this vegetation type occurred in the most rugged portion. Interestingly, McMillan notes that there is little apparent difference between this type and the barrens. He notes that there are openings in the forest covered with grasses and other herbaceous vegetation, and that the density of trees is low, based on distances from a section corner to witness trees (McMillan 1976a:31). The difference between the oak-hickory forest zone and the oak barrens is most strongly marked by the relative frequencies of white oak and black oak in the two zones, as indicated by a tabulation of witness trees from survey records. In the oak-hickory forest zone, white oak comprised 71.5 percent of the witness trees, while black oak comprised 17.6 percent. In the oak barrens, however, white oak comprised only 5.2 percent, while black oak comprised 19 percent of the trees mentioned (McMillan 1976a:32; Table 2.3).

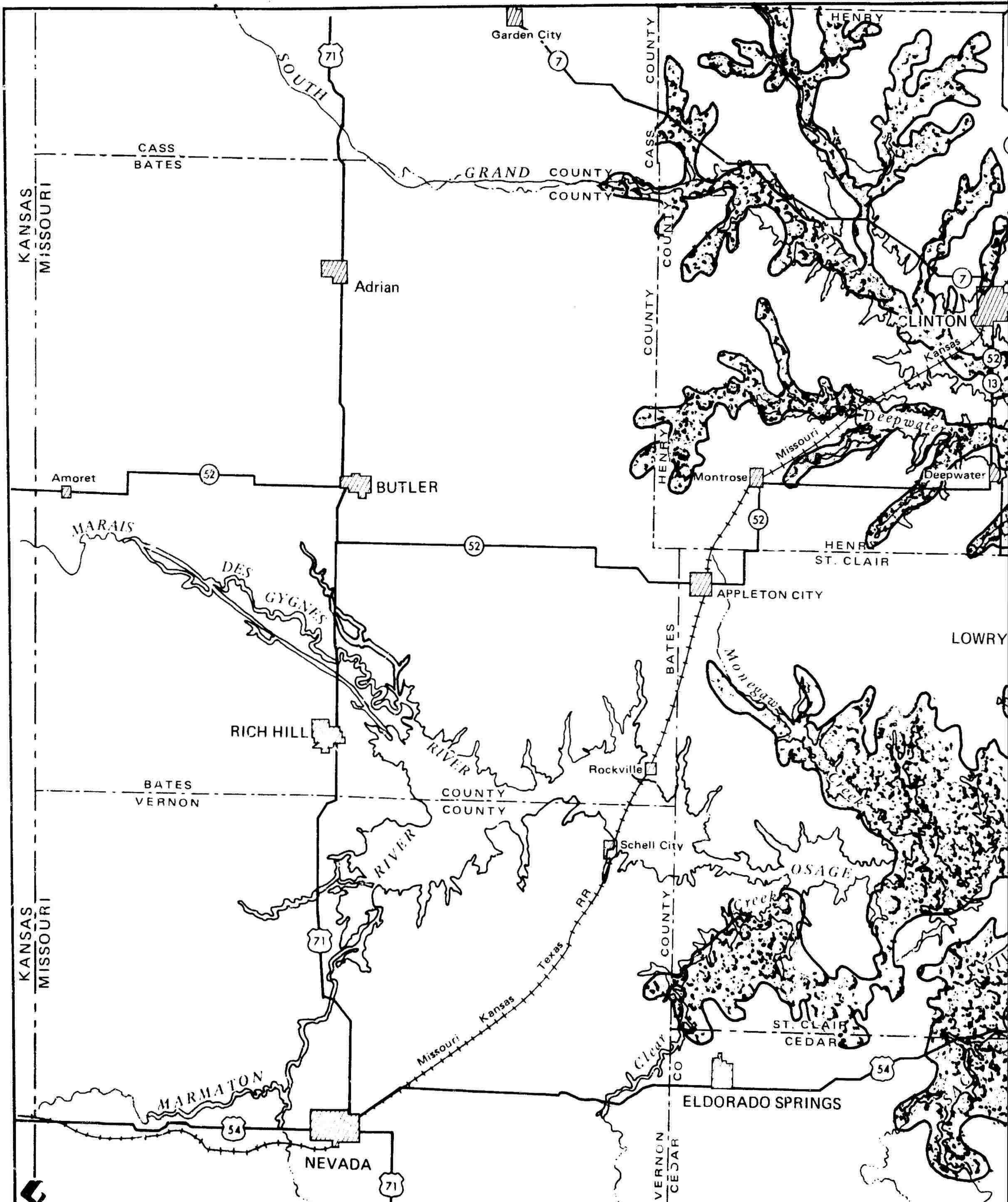
## Bottomland Forest

This vegetation zone occupies the floodplain of the Pomme de Terre River and its larger tributaries in the area that was mapped by McMillan (1976a). In the study area as a whole, this vegetation zone would be found in the floodplains of the Osage, South Grand, and Sac Rivers, in addition to the floodplains of the larger tributaries. As the vegetation in this zone is controlled by moisture, it can be expected to expand and contract in the upper reaches of tributary valleys with fluctuations in precipitation characteristic of the region (King 1978:76). This zone supports the most diverse flora of any zone discussed so far. The number of different tree species noted in surveyors line descriptions was 25 for this zone compared to 13 species for the oak barrens and 15 species for the oak-hickory forest zone (McMillan 1976a: Table 2.4). It is not really correct to speak of principal species for this zone, because the most common species, black oak and bur oak (Q. macrocarpa) occur in frequencies of 6.2 percent and 9.3 percent respectively, while the dominants in the oak barrens, for example, post oak and black oak, have frequencies of 26.0 percent and 19.5 percent (McMillan 1976a: Table 2.4). Fifteen of the tree species which comprise the bottomland zone are unique to it, at least in terms of the surveyors' line descriptions. These species include white hickory (C. tomentosa), shellbark hickory (C. laciniosa), white elm (Ulmus americana), red elm (U. rubra), red maple (Acer rubrum), ash (Fraxinus spp.), box elder (A. negundo), mulberry (Morus rubra), hackberry (Celtis occidentalis), black cherry (Prunus serotina), sycamore (Platanus occidentalis), Paw Paw (Asimina triloba), and buckeye (Aesculus glabra). McMillan (1976a:32) notes that there are a number of different microhabitats in this zone, which would also contribute to the diversity of the vegetation present.

The foregoing discussion was designed to acquaint the reader with the variety of vegetation zones present and the species of which they are composed. Any attention will now shift to a discussion of the findings of King (1978). This study, as noted above, differs in emphasis and scope from McMillan's brief treatment. Rather than focus on the reconstruction of vegetation zones, King has oriented her study towards a consideration of those variables which influence the distribution of vegetation in the study area. A second focus to her study is the estimate of the potential plant food resources in the area. The discussion presented below relies heavily on King's study.

King used, as did McMillan, the records of the Government Land Office to reconstruct the presettlement vegetation of the study area. Rather than tabulate every quarter-section and section corner in the reservoir area, a transect that crossed all of the different bedrock and soil types was chosen. This transect was located in Benton and northern Hickory counties and included about 500,000 acres (King 1978:9).

King's map of the presettlement vegetation has been reproduced and is presented as Figure 3. Species were tabulated by four landform categories: bottomland, slope, barrens and upland. The bottomland category had 25 species noted, slope had 21, and the barrens and upland, 11 each. Principal species in each category include post oak, black oak, white oak, blackjack oak and bur oak (Q. macrocarpa). A number of interesting facts also emerged from the analysis of these data. First, there is a strong relationship between the amount of slope and



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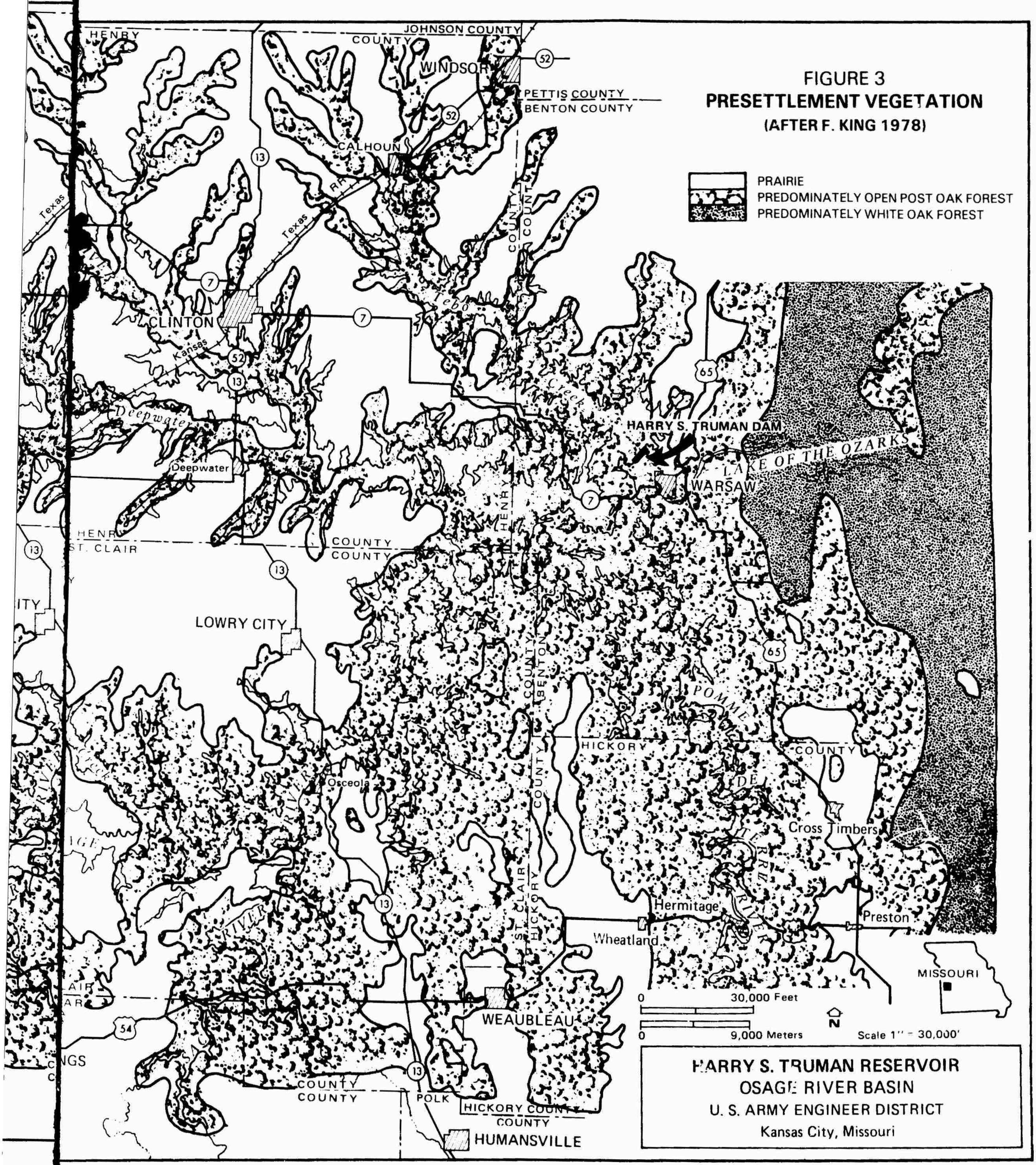



FIGURE 3
**PRESETTLEMENT VEGETATION**
**(AFTER F. KING 1978)**

forest vegetation. King (1978) recorded the amount of slope present at each quarter-section and section corner. When these data were compared with the vegetation present, it was found that in the 0-2 percent slope category, 90 percent of the points had prairie vegetation. Conversely, in the 14 percent and greater slope category, 97 percent of the points were forested (King 1978:15). An analysis of the density of the presettlement forest indicated that the density of trees in all zones was low when compared with density estimates from other presettlement vegetation studies in Missouri and Illinois. Density estimates for the study area were 15 trees per acre in the bottomland forest, 20 trees per acre in the slope/upland forest and one tree per acre in the barrens (King 1978:16). These densities are also substantially below modern forest density, which can exceed 200 trees per acre in mesic settings in mid-Missouri (Rochow 1972 cited by King 1978:16). Species associations were associated was also examined. It was found that the four principal species were associated with a tree of the same species between 52 percent and 71 percent of the time, depending on the species. The nature of the association also follows a moisture gradient with the blackjack oak, which prefers xeric habitats, associated with post oak. Post oak associates most frequently with black oak. Finally black oak is associated with white oak, a species which favors mesic habitats.

King (1978:6; Figure 2.3) tabulated five slope categories against the bedrock geology. This exercise showed that there is a relationship between slope and the bedrock geology. For example, in the Pennsylvanian sandstones and shales of the western part of the study area, approximately 80 percent of the points tabulated had slopes of less than 5 percent. In contrast, approximately 70 percent of the points in the Roubidoux dolomite and sandstone area have slopes greater than 5 percent. King used this relationship in plotting the dominant tree species against the bedrock geology and found that the vegetation was strongly controlled by this factor (King 1978:20; Figure 2.9). Post oak dominated communities occurred primarily on Burlington dolomite and Jefferson City limestones. White oak dominated communities occurred primarily on Roubidoux dolomites and sandstones. Pennsylvanian age shales and sandstones were primarily unforested.

When species present in each community are tabulated against the four landform categories, bottomland, slope, upland and barrens, very striking differences are evident. In the post oak area, 61.2 percent of the area is forested, prairie is present in 27.9 percent of the area, and barrens account for 10.5 percent. This contrasts markedly with the white oak dominated area, 95.6 percent of which is forested (King 1978:20; Table 2.3). Aspect and elevation also condition the composition of slope forests. In general, north and east facing slopes are more mesic, while south and west facing slopes are more xeric. In addition, the lower the position on a slope, the more mesic it is. As a result, white oak and black oak occur more frequently on slopes than in flat areas, either in the uplands or bottomlands (King 1978:25). Upper south and west facing slopes are dominated by post oak and blackjack oak (King 1978:25). Species diversity increases along a moisture gradient in both the post oak and white oak areas, and in many respects both areas are very similar, including the relative proportions of the dominants (King 1978:27).

In summary, the foregoing discussion has attempted to outline some of the vegetation zones present as delineated by McMillan (1976a) and, following King (1978), some of the variables, such as bedrock geology, topography, slope, and

aspect, which affect the composition of the vegetation in any given portion of the study area. When the composition of the forest was examined, it was found to depend, in both studies, on factors like landform, slope, and aspect. It should be understood that landform and slope are interrelated, as are slope and aspect, and these all condition the moisture retention of the soils present. Species diversity was highest in the bottomland, with this setting having many species which do not occur elsewhere in the study area. Lower south and east facing slopes were the next most diverse, with the least diverse settings being the uplands. Prairie vegetation was found to be not under the control of bedrock geology or soils, but influenced by the amount of moisture present.

Both studies indicate that the vegetational distribution in the study area is complex, although general patterns can be recognized. When a larger region is considered that includes areas of predominantly oak-hickory forest and prairie, it can be seen that the area of concern to us here is truly a zone of transition between these major biomes. An important consideration of prehistoric adaptations in this area is that it is not necessarily the diversity of species present, but the diversity of settings which will most strongly affect the utilization of plant food resources by humans and animals.

## FAUNA

The location of the study area in the transition zone between the forest and prairie has had its effect not only on the vegetation as was discussed but also on the fauna. As McMillan (1976a:35) has noted, this situation has often resulted in increased variety and density of species present. Odum (1971:157) has called this the "edge effect." This is certainly present in the study area, with species present that are adapted not only to the forest or the prairie, but to the transitional community as well. There are over 50 species of mammals, numerous amphibians and reptiles, fish and molluscs present in the study area. Rather than list all of these here, the reader is directed to McMillan (1976a:35-41; Tables 2.7, 2.8, 2.9, 2.10) for a complete listing of the various faunal species present in the reservoir. Surface soil conditions are such in the study area that it is not reasonable to expect the recovery of faunal remains from surface collections, and that was our experience in the survey reported here.

I would like to make a few comments about the body size distributions of the mammalian fauna. Although 54 mammals sounds like a tremendous variety, and the implication might be drawn that the study area is rich in resources, a look at body sizes gives a very different picture. Twenty-two of the species present weigh less than 50 grams. These species are primarily bats and small rodents. Eleven species weigh between 100 grams and one kilogram. Ten species weigh between one kilogram and 10 kilograms, five species weigh between 20 and 50 kilograms, three species weigh between 50 and 100 kilograms and three species weigh more than 100 kilograms. When it is considered that predators are included in this list, such as fox, coyote, and mountain lion, the number of species which might be of economic importance dwindles to less than 20. The abundance of some of these larger species also might be questioned, although there is, of course, no data concerning the prehistoric abundances of these. It is reasonable to except, however, that bear, pronghorn antelope and bison would not be necessarily prolific in the project area.

On the other hand, the abundance of deer is likely to be quite high, given that it prefers edge situations.

## CLIMATE

An appreciation of the climate of the study area and the surrounding region is important because it is widely held that the relationships between the major vegetational features, the forest and the prairie, are climatically controlled. As was noted above, the study area lies across the border between the prairie and the forest. Second, the study area lies along the southern margin of the Prairie Peninsula, which is a wedge shaped area of grassland that extends from Kansas eastward through Missouri and Iowa into Illinois. Borchert (1950) has presented a series of arguments which suggest that the distribution of the prairie in this area is due to climate.

The climate of the study area is characterized by the seasonal dominance of two air masses, the tropical air mass (during the summer) and the arctic air mass (during the winter), and is considered to be of the humid continental warm summer type (Critchfield 1974:192). The geographical extent of this climatic type is from the eastern edge of the Great Plains through the mid-continent to the Atlantic Coast, being interrupted only by the Appalachians. It is "roughly coextensive" with the Corn Belt (Critchfield 1974:193). When the polar and tropical air masses meet, the result can be very turbulent and changeable weather patterns. As McMillan (1976:19) noted, the expression of temperature and precipitation averages for this area masks substantial variability year to year. There are also substantial differences in mean January and mean July temperatures (see Table 3).

This climate type has two phases. In winter, it is a northern climate; in summer, it takes on the characteristics of the humid subtropics. In winter, mean annual minimums can be on the order of -30°C in northern Iowa and -20°C in some parts of southern Missouri. In summer, temperatures and humidity are high enough that there is little difference between the climate in the study area and that of the southeastern United States.

Precipitation of this climate type varies from 50 cm to 125 cm (Critchfield 1974:194) with the northern margins and continental interior receiving less. Most precipitation falls in spring and summer. Most of the rain is convective, that is, due to differences in the temperature of the air and the ground. Some rain is frontal, however. Scattered thundershowers are common. Winter is a period of low rainfall, and it is primarily frontal in nature.

## TABLE 3

## TEMPERATURES, PRECIPITATION, AND LENGTH OF GROWING SEASON

| | January Average | July Average Temperature | Annual Precipitation | Length of Growing Season |
|---|---|---|---|---|
| Bates | 31.9 | 78.4 | 38.89 | 181 |
| Benton | 33.5 | 79.4 | 43.92 | 177 |
| Henry | 31.9 | 79.7 | 40.08 | 186 |
| Hickory | n.d. | n.d. | 40.31 | 178 |
| St. Clair | 32.0 | 79.4 | 38.00 (42.15) | 188 |
| Vernon | 33.6 | 79.4 | 39.18 | 186 |

## III ARCHEOLOGICAL BACKGROUND

### CULTURE HISTORY

In this section, a brief history of human occupation in the study area and the region will be presented. This will provide a framework for discussing the dynamics of prehistoric cultural adaptations. We will use the framework proposed by Griffin (1967) with Chapman's (1975) modifications for Missouri. Griffin's scheme is straightforward and familiar. Beginning with Paleo-Indian, three divisions of the Archaic -- Early, Middle, Late -- follow. The next major period, the Woodland, is also divided into three parts -- Early, Middle, Late. Coeval with the Late Woodland in Griffin's scheme is the Mississippian period. Chapman's scheme for the prehistory of Missouri is broadly similar. Major differences from Griffin involve the placement of a Dalton period between Paleo-Indian and Early Archaic and no consideration for the contemporaneity of the Mississippian with the Late Woodland (Chapman 1975). These schema broadly agree with regard to the estimated dates of these periods (see Figure 4). Consideration should also be given to schema developed for the Great Plains Area to the west, given the location of the study area in the boundary zone between the Plains and the eastern Woodland (Figures 5 and 6). There are a number of sequences proposed for various parts of the Central and Northern Plains. These include those offered by Caldwell and Henning (1978) for the Central Plains, Wedel (1959) for the north-central Plains, and for southeastern Kansas (Marshall 1972) and the Plains in general (Lehmer 1971; Willey 1966). While there are a number of differences among these frameworks, they are all in broad agreement concerning the time at which the shift from the Archaic to the Woodland period occurred: approximately AD 0 (Figure 7). These schema also agree broadly in that no subdivision of the Archaic is attempted. Following Paleo-Indian there is a generalized Archaic period lasting anywhere from 7000 years (Caldwell and Henning 1978) to 4000 years (Willey 1966).

These frameworks differ primarily in how the post-Archaic period is subdivided and what these subdivisions are called. Lehmer (1971) and Willey (1966) divide this period into two parts, a Plains Woodland followed by a Plains Village period. Caldwell and Henning (1978) have this also, but include a Central Plains Tradition and a Middle Missouri Tradition coeval with the Plains Village period. What these frameworks have in common is a classification independent of the Griffin/Chapman framework. The frameworks of Wedel (1959) and Marshall (1972) have as their initial Woodland periods the Hopewell Phase, which would be Middle Woodland in the Griffin/Chapman schema.

These sequences from the Plains differ from the Griffin/Chapman frameworks in three major respects. The first of these is that the tripartite (or quatripartite in Chapman's scheme) division of the Archaic is not recognized in the Plains sequences. The second difference is that the beginning of the Woodland period is placed approximately 1000 years later in the Plains than in the Eastern Woodlands. The third major difference is that the Woodland period in the Plains is not divided into three parts by some authors, and, if it is, it is considered to begin with a taxonomic unit equivalent to the Middle Woodland. These Hopewell-like units are, however, broadly contemporaneous with the Middle Woodland of Griffin (1967).

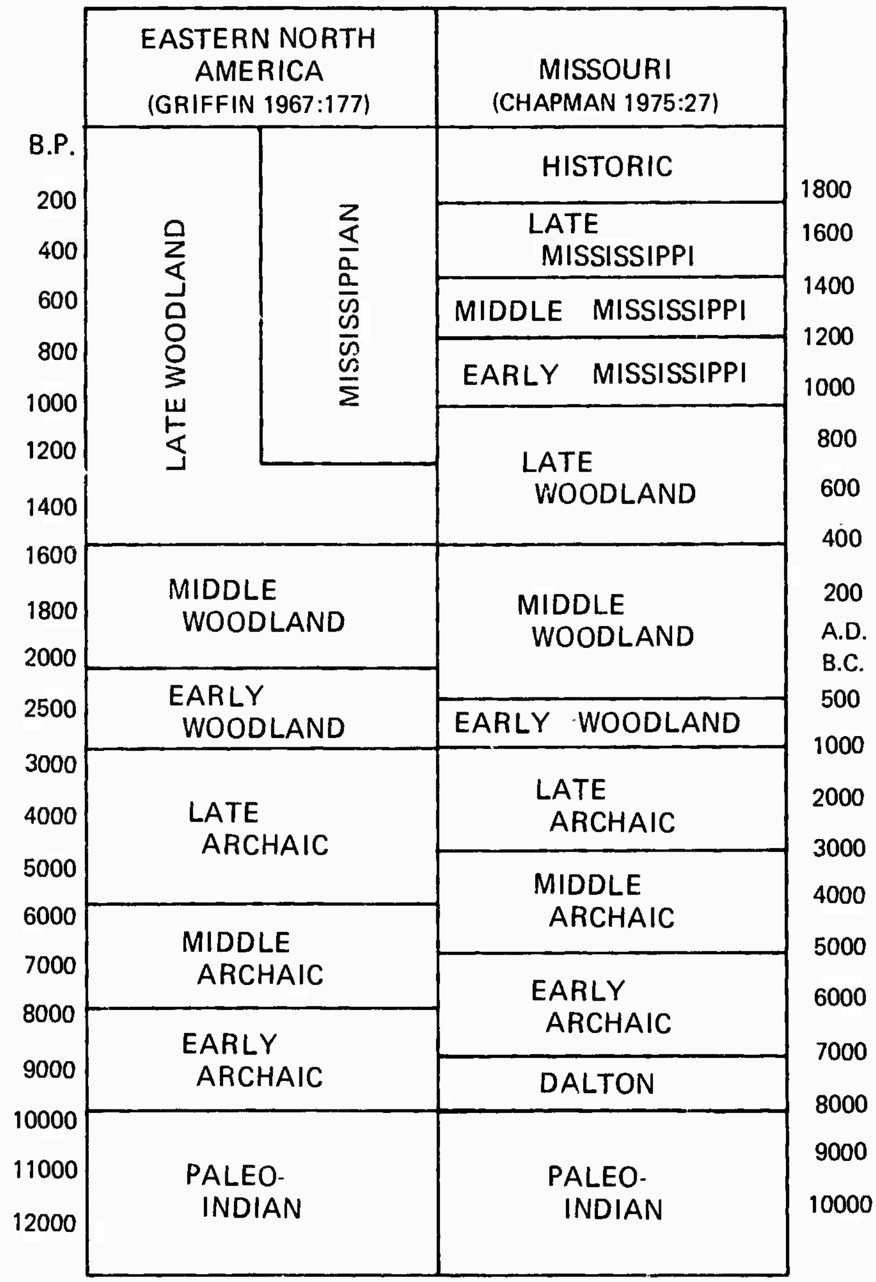



FIGURE 4
**BASIC CULTURE SEQUENCES FOR MISSOURI**
HARRY S. TRUMAN RESERVOIR — OSAGE RIVER BASIN
U.S. ARMY ENGINEER DISTRICT — KANSAS CITY, MISSOURI

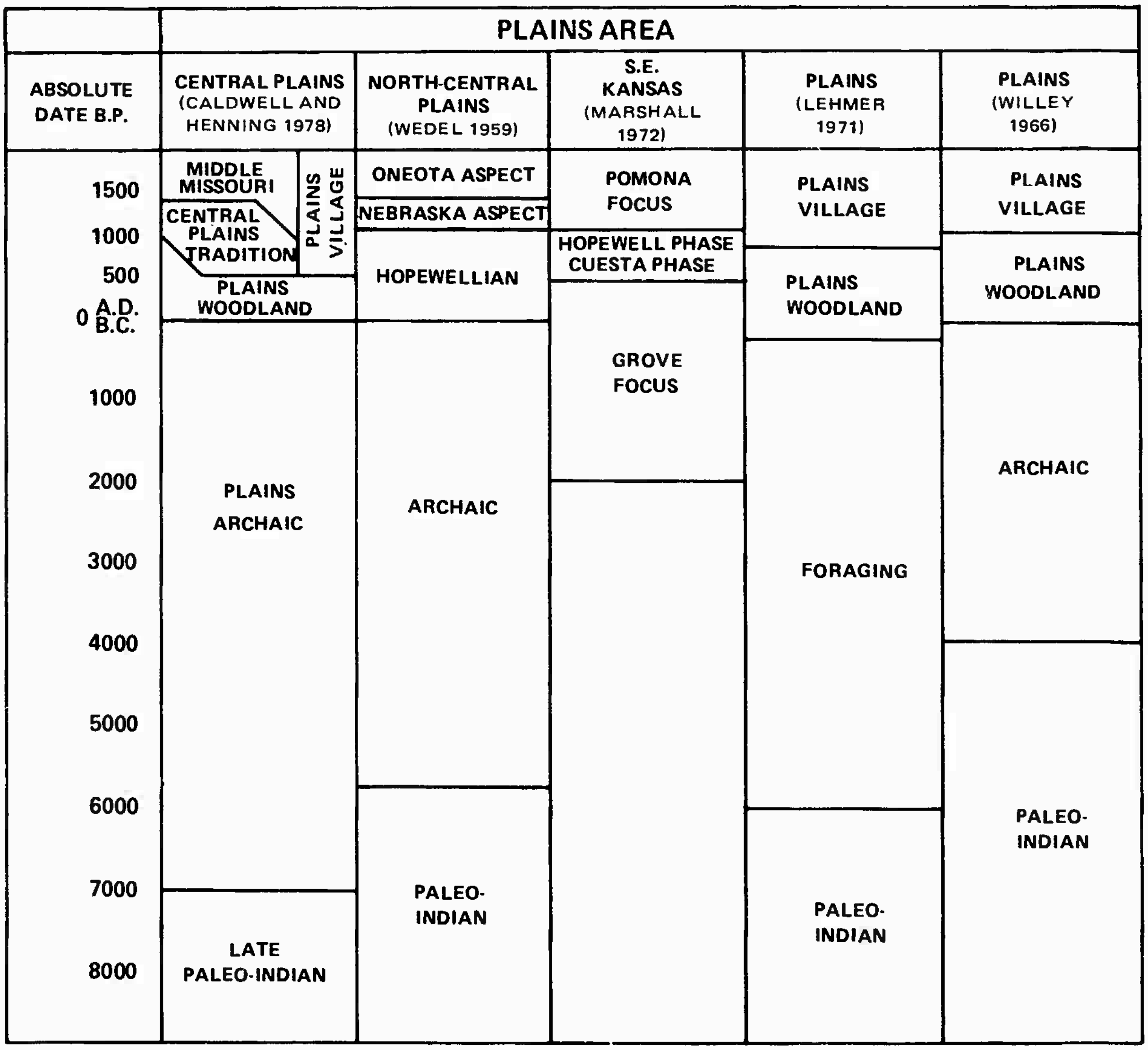



FIGURE 5

**ARCHEOLOGICAL AND ENVIRONMENTAL SEQUENCES IN THE PLAINS AREA**

HARRY S. TRUMAN RESERVOIR — OSAGE RIVER BASIN
U.S. ARMY ENGINEER DISTRICT — KANSAS CITY, MISSOURI

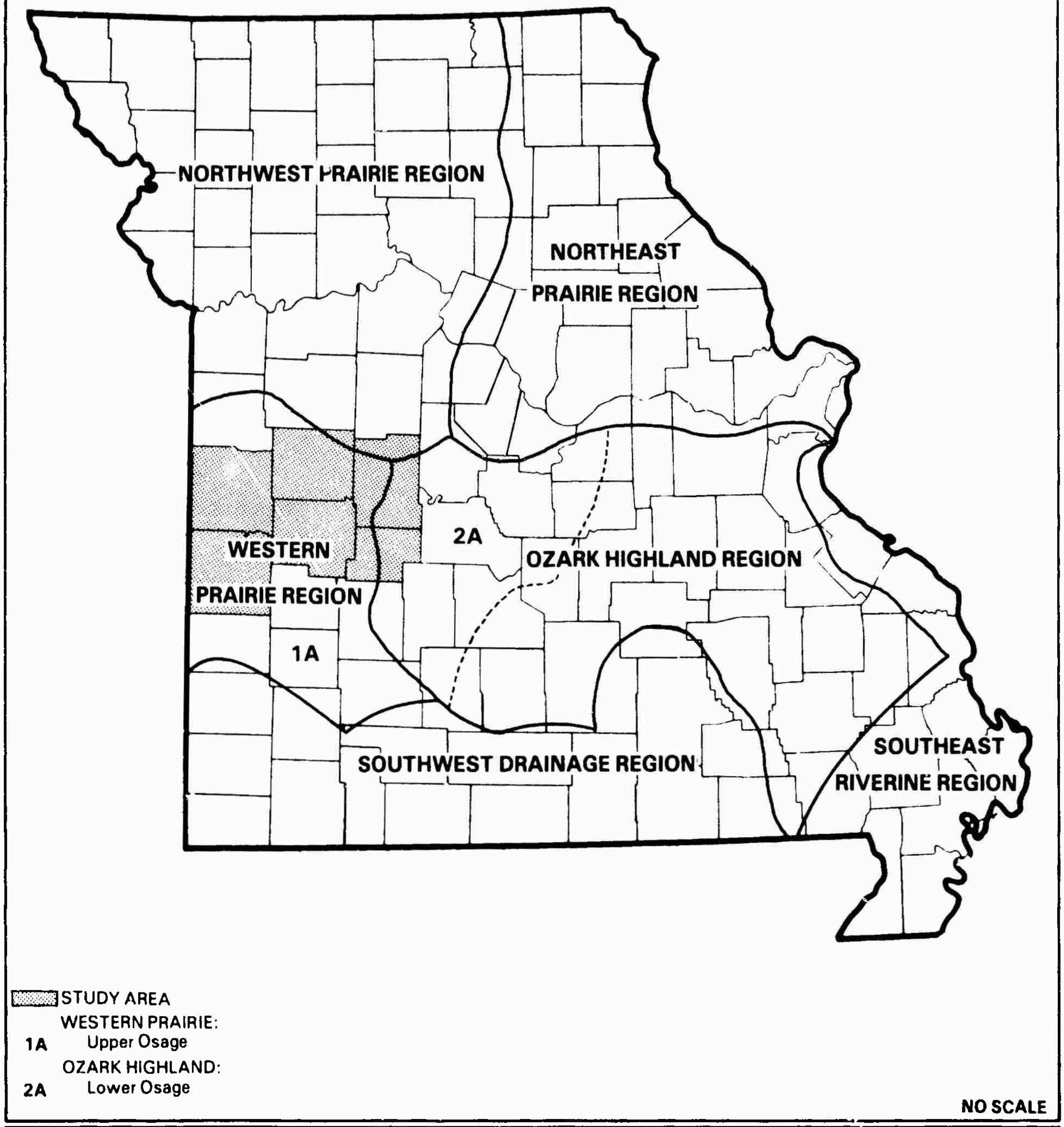



FIGURE 6
**ARCHEOLOGICAL REGIONS OF MISSOURI**
**(AFTER CHAPMAN 1975)**

HARRY S. TRUMAN RESERVOIR — OSAGE RIVER BASIN
U.S. ARMY ENGINEER DISTRICT — KANSAS CITY, MISSOURI

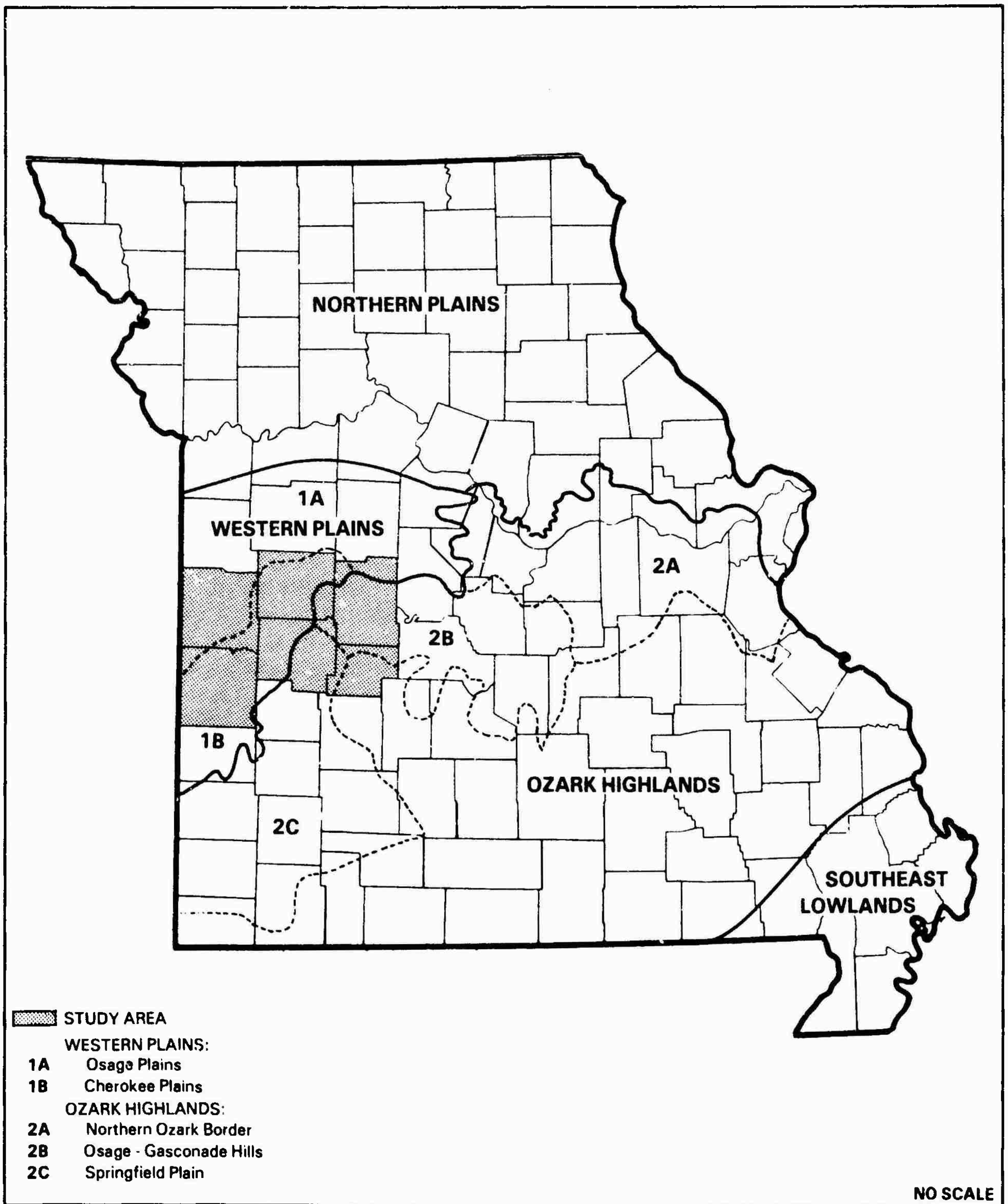



FIGURE 7
**PHYSIOGRAPHIC REGIONS OF MISSOURI**
**(AFTER CHAPMAN 1975)**

HARRY S. TRUMAN RESERVOIR — OSAGE RIVER BASIN
U.S. ARMY ENGINEER DISTRICT — KANSAS CITY, MISSOURI

Also absent from the Plains sequence is the Mississippian period, although the various authors would recognize Mississippian elements as being present (Wedel 1959; Marshall 1972).

The sequence from the Kansas City Area offered by Johnson (1974) does have a tripartite Archaic and two divisions of the Woodland, Kansas City Hopewell and Late Woodland. The Mississippian period is recognized here also as the Steed-Kisker Focus (Wedel 1943; Johnson 1974; O'Brien 1978).

This brief discussion of the sequences of the region is offered because of the location of the study area on the boundary between the eastern forests and the Great Plains. We will now briefly contrast these sequences with the one revealed by the excavation of Rodgers Shelter (23BE125). The sequence discussed is the one offered by Kay (1978; see Figure 6). This is a revision of the sequence offered by McMillan (1976b). A four part Archaic is recognized, following Chapman (1975), but the dates of these divisions differ, substantially so for the Late Archaic. The evidence from Rodgers Shelter suggests that the Late Archaic persisted in this area until after the time of Christ, or over a 1000 years later than the Griffin/Chapman scheme indicates. In addition to this, the evidence from Rodgers Shelter does not support a three part Woodland or a clearly demarcated Mississippian period. The topmost horizons, Horizon 1 and Horizon 2, are classed as Woodland/Late Archaic and Woodland/Mississippian, respectively (Kay 1978:4-19). A consideration of this sequence, relative to those previously discussed, gives a distinctly "Plains" cast to the history of human occupation of the study area. Roper (personal communication, 1981) has said that evidence from recent excavations in the reservoir area has corroborated the persistence of the Late Archaic into the Christian era. She has also argued (1978), on the basis of survey and other data, that beginning with Late Archaic, there began an adaptation that continued largely unchanged in its major elements up until the Historic period.

This all suggests that the Griffin/Chapman schema might be largely inappropriate for discussing the occupational history of the Truman reservoir area. This would be true if we were to attempt to force the archaeological data into the various taxa. If, however, it is retained for reference and correlative purposes, it can be useful since individual elements present in the archaeological record are indeed "diagnostic" of the various taxa present in the Griffin/Chapman schema. For example, Hopewell sherds are present in small numbers at many sites, and, although the investigators would not classify these assemblages on that basis, their presence is an indicator of certain cultural dynamics. Retaining the Griffin/Chapman schema as a point of reference emphasizes that the archaeological record of the study area, while distinctive in many respects, has some similarities to the classic sequence. This juxtaposition has lead some to consider the study area marginal to the major cultural developments of the eastern United States (Martin et al. 1947; Baerreis 1951; Chapman 1952). A consideration of the nature of the "marginality" of the Ozarks will be a major focus of this report.

In the next section of the chapter, the occupational history of the study area will be discussed, organized in terms of the Griffin (1967) and Chapman (1975) schema. A combination of both will be employed. Dalton will be retained from the Chapman scheme, and, following Griffin, the Mississippian period will be considered to be coeval with the Late Woodland. The dates bracketing the cultural

periods will follow Griffin (1967). Differences in dates, such as those discussed above for Rodgers Shelter, will be noted (Figure 8).

**Paleo-Indian (14,000-10,000 BP)**

Only one Paleo-Indian point has been reported from the study area (Roper 1981). It is considered to be a Plano point because it is unfluted. The point was found in Henry County, in an upland location (Roper 1981:5-6). This scarcity of Paleo-Indian remains accords well with the results of a distributional study of Paleo-Indian point finds in Missouri (Chapman 1967a, 1967b, 1973, 1975) which indicates that one find each was reported for Benton, St. Clair, and Bates Counties. From a state-wide perspective, the distribution of Paleo-Indian points is densest in the St. Louis area and then westward along the Missouri River to Howard, Saline and Cooper Counties in the Big Bend area.

Although Paleo-Indians are widely considered to be "Big-Game Hunters" who exploited now extinct Pleistocene megafauna, this point of view has little empirical support, especially in the eastern United States. There is very little basis on which to speculate about the nature of a Paleo-Indian adaptation in the study area or even the State of Missouri, given that most of the finds are isolated and occur in upland locations which are subject to erosion (cf. Roper 1981c:315-316). Roper, in an attempt to account for the sparsity of Paleo-Indian occupation in the study area, has suggested three possible reasons. The first of these is the most obvious, that Paleo-Indian use of the area was extremely low. The second is sampling error, but Roper believes that the results of a recent survey of the public use areas, during which 330 sites were recorded, mitigates against this possibility (Roper 1981c:315). The third possibility, which she considers reasonable, is that Paleo-Indian sites have been destroyed by geomorphic processes in both the uplands and bottomlands (Roper 1981c:315-316). At present, there is little basis upon which to evaluate any of these three possibilities.

**Dalton (10,000-9000 BP)**

This period has been proposed by Chapman (1975:95) to reflect the transition from Paleo-Indian to the Archaic. It is during this period that there is the first definitive evidence of human occupation of the study area. Horizon 10 at Rodgers Shelter (23BE125) has been interpreted as a series of ephemeral campsites centered around hearths (McMillan 1976b:224). The Dalton assemblage here included Dalton and Plainview points. Dalton points are, of course, considered diagnostic of this period. Other components of the Dalton assemblage at Rodgers Shelter were scrapers, bifacial knives, gravers, manos, bone perforators, antler flakers, a whetstone, and an adz (McMillan 1971: Table 19; Table 20). The Dalton occupation here is estimated to date between 9500-10,500 years ago based on radiocarbon dates (Kay 1978: Table 4-3).

The University of Missouri's Stage I and Stage II surveys located 11 Dalton sites. Ten of these were surface occurrences, while one, the Hand Site (23SR569) was buried approximately 2.5 meters below the surface (Roper 1977; Joyer and Roper 1980; Piontkowski 1977). The contexts of these finds or the nature of the investigation do not make inferences about Dalton period adaptations feasible at this time. Joyer and Roper (1980:18) do note, however, that these sites are found

| TEMPORAL SPAN+ | HORIZON | CULTURAL AFFILIATION |
|---|---|---|
| 1000 – 1750 | 1 | WOODLAND/ MISSISSIPPIAN |
| 1750 – 2500 | 2 | WOODLAND/LATE ARCHAIC |
| 2500 – 3600 | 3 | LATE ARCHAIC |
| 3600 – 5200 | 4 | LITTLE OCCUPATION |
| 5200 – 6700 | 5 | MIDDLE ARCHAIC |
| 6700 – 7500 | 6 | MIDDLE ARCHAIC |
| 7500 – 8100 | 7 | MIDDLE – EARLY ARCHAIC |
| 8100 – 8600 | 8 | EARLY ARCHAIC |
| 8600 – 9500 | 9 | LITTLE OCCUPATION |
| 9500 – 10500 | 10 | DALTON |
| 10500 – 11000 | 11 | LITTLE OCCUPATION |

+Radiocarbon years (Before Present)

FIGURE 8
**REVISED HORIZONS AT ROGERS SHELTER**

HARRY S. TRUMAN RESERVOIR – OSAGE RIVER BASIN
U.S. ARMY ENGINEER DISTRICT – KANSAS CITY, MISSOURI

on the major streams in the study area. In addition, they are located in narrow bottomland settings (Joyer and Roper 1980:18).

### Early Archaic (9000-7000 BP)

Artifacts considered to be diagnostic of this time period were found at 37 sites during the initial surveys of the reservoir area (Roper 1977:167). At that time, Graham Cave, Hidden Valley, Hardin, and bifurcated base projectile points were considered to be diagnostic. The Wolf Creek Site (23SR567) contained a buried horizon in which a LeCroy point was found. Based on cross-dating with well-dated contexts in Tennessee (Chapman 1975) and West Virginia (Broyles 1966), the occupation at this site was dated at 9000 to 8000 BP (Piontkowski 1977:31). Due to the limited nature of the investigations, very little can be inferred about the nature of the occupation here.

Rodgers Shelter (23BE125) contains two horizons which are classified as having Early Archaic materials. These are Horizon 8, which is dated at 8600-8100 BP and Horizon 7 dated at 8100-7500 BP (Kay 1978: Table 4-3). These were originally called Middle Archaic I by McMillan (1976b:224-225). McMillan notes that the adaptation reflected here is substantially different than in the preceding Dalton Horizons. Rather than short-term campsites, use of the shelter as a base camp is indicated. Based on the activity indicator analysis (Ahler and McMillan 1976), a wide range of activities is suggested, the more important of which appear to be tool manufacture and maintenance and plant processing. Faunal evidence indicates that the procurement of small game, especially squirrels, was important. The remains of bison are present, but in very small numbers. Deer do not appear to have been important. Although it is not known what season the shelter was occupied, nor the duration of the occupation, no storage or cache pits were found (McMillan 1976:224-225).

### Middle Archaic (7000-5000 BP)

Fourteen sites dating from this period were found during the University of Missouri's Stage I and Stage II surveys, based on the presence of Big Sandy Notched or Jakie Stemmed projectile points (Roper 1977:169-170). Rodgers Shelter (23BE125) contains a Middle Archaic occupation of considerable duration. Earlier investigations revealed probable Middle Archaic occupations at the Saba Shelter and the Miller Site (Vehik 1974); Blackwell Cave (Falk 1969): Brownlee Shelter (Chapman and Panghorn 1965); Harrison Shelter (Sudderth 1965); and Woody Shelter (Sudderth and Chapman 1965).

The Middle Archaic occupation at Rodgers Shelter is dated at 7500-5200 BP (Kay 1978: Table 4-3). McMillan interprets the occupation during this time to reflect a continuation of the pattern begun during the Early Archaic (his Middle Archaic I). Major differences between the two include a decrease in squirrels and an increase in rabbits and small rodents in the faunal assemblage; a decrease in the amount of plant processing; and the first indication of more than casual use of mussels. Little hunting is indicated by both the activity indicator analysis and the paucity of deer remains in the faunal assemblage. As with the Early Archaic occupation, there were no storage or cache pits (McMillan 1976:225).

Locational analysis of Middle Archaic sites recorded during the Stage I and Stage II surveys indicates that the emphasis during this time was on exploitation of the bottomlands, given that most of the land within a mile of each site was bottomland (Joyer and Roper 1980:19). This conforms well with the fact the the Hypsithermal was in full swing at this time, resulting in a reduction of upland plant resources (King 1978; King 1980). This pattern was also noted for Middle Archaic site locations on the Sac River downstream from the Stockton Dam (Roper 1977b).

It should be noted at this time that the division of this time period (9000-5000 BP) into the Early Archaic and Middle Achaic is largely arbitrary and, as was noted above, was adopted to permit both comparison and contrast with the "classic" Eastern sequence. The results of excavations at Rodgers Shelter and other rock shelters in this area and Missouri indicate that fossils for these different periods are often associated with each other. The chart by Kay (1978: Figure 8-55) and his discussion (Kay 1978:167-168) clearly show this to be the case. Roper (1977) was also aware of this problem in her discussions of the culture history of the area. The results of the University of Missouri's recent intensive investigations in the reservoir has lead her to suggest that it may be more profitable not to divide this time period into two periods, but to view it as a single complex (Roper 1981b). Kay, while he notes that Dalton and Early Archaic types continue into the Middle Archaic, does suggest that there is an Early Archaic and Middle Archaic Point complex at Rodgers Shelter (Kay 1978:8-165).

**Late Archaic (5000-3000 BP)**

In contrast to the rather meager evidence available for the earlier periods of the Archaic, this time period is very well represented in the study area and the region. Facilitating identification of sites from this time period is the presence of a number of projectile point types that are distinct from the preceding Early-Middle Archaic point types, and to a lesser degree, from the subsequent Woodland (Kay 1978:8-168). These projectile point types include Afton, Smith Basal-Notched, Etley, Sedalia, Nebo Hill, and the Table Rock Dart (Roper 1977a:27; Kay 1978:8-168; Joyer and Roper 1980:19-20).

This break from the Middle Archaic is also noted at Rodgers Shelter which has a Late Archaic occupation beginning about 3600 BP after an approximately 1600 year interruption in the use of the site (Kay 1978: Table 4-3). The Late Archaic may persist into the Christian era here as Horizon 2 is classed as Woodland/Late Archaic with a temporal span of 2500-1750 BP. It might be noted at this time that these end dates for Late Archaic are substantially different from that proposed by Chapman (1975).

The Late Archaic occupation at Rodgers Shelter is interpreted by McMillan (1976b:225-226) as being quite different from the previous Middle Archaic occupation. This is to be expected in some ways because the Hypsithermal had ended by this time and the vegetation had changed from upland prairies in the east to the forested conditions that persisted until modern times (Joyer and Roper 1980:20). Deer hunting, largely absent during the Middle Archaic, became very important and is reflected both by the activity analysis and the faunal assemblage. Turtles and mussels were also heavily exploited. Other differences noted included differences in the nature of domestic and maintenance activities and an increase in ritual and

ceremonial activities marked by the presence of two burials (McMillan 1976b:226; Table 12.7).

The first evidence of cultigens in the study area occurs during this time at the Phillips Spring Site (23HE216) (Chomko and Crawford 1977; Chomko 1978; F. King 1980). Both squash (Cucurbita pepo) seeds and bottle gourd (Lagenaria siceraria) seeds were found in a layer that dates from about 4200 BP (King 1980). Although there were additional and younger Late Archaic components at this site, only one uncarbonized seed was found in one feature (Feature 414; King 1980: Table 1). King concludes, on the basis of this evidence and evidence from western Kentucky (Marquardt and Watson 1977) and eastern Tennessee (Chapman and Shea 1977), that tropical cultigens were present by 4300 BP in the eastern United States (King 1980:224-225).

Based on the presence of Smith, Afton, Sedalia, Table Rock Stemmed, Nebo Hill, Etley and Cupp projectile point types, 35 sites from the Stage I and Stage II surveys were assigned to the Late Archaic period (Roper 1977a:1973). It is further suggested that this number is low due to the inability to classify a large number of corner-notched and lanceolate points that were found (Roper 1977a:175). The likelihood of finding Late Archaic sites during a survey is enhanced by the lower aggradation rates of the major streams during this period (Ahler 1971; Haynes 1976).

Joyer and Roper (1980:20) note that, in contrast to the Early and Middle Archaic, sites from the Late Archaic are found in a larger variety of settings. Secondly, there are indications of patterned variability in site size and type reflected by differences in debris density and tool diversity. There is also some evidence to suggest regional differentiation between and among point types. For example, Etley points are largely restricted to the eastern edge of the study area, while Nebo Hill points are restricted to the western part of the South Grand River (Joyer and Roper 1980:20; Figure 9). This accords well with the fact that Etley points are diagnostic of the Titterington Focus which is well known to the east in Missouri (Klippel 1969) and especially in Illinois (Cook 1976). Nebo Hill, on the other hand, is centered in the Kansas City region (Shippee 1948; 1964; Reid 1980; Joyer and Roper 1980:20) also suggest that the diversity of projectile point styles may reflect both temporal and functional variability during this time period. These suggestions cannot be evaluated, however, with the evidence available.

The intensification of occupation that is a hallmark of the Late Archaic in the eastern United States is manifested here not only by the factors mentioned above, but also by the appearance of two definable complexes, the Nebo Hill complex and the Sedalia complex. The Hebo Hill complex, named after the type site near Kansas City (Shippee 1948; Reid 1978), is characterized by a distinctive lanceolate projectile point that confused earlier investigators about its temporal placement (Chapman 1975:135).

The Sedalia complex is named after a group of sites found in Pettis County, which is north of the study area (Seelen 1961; Chapman 1975:200-203). The tool diversity noted by Joyer and Roper (1980:20) above is especially evident at these sites. Artifact types characteristic of the Sedal1978), is characterized by a distinctivia complex include the Sedalia Lanceolate, Clear Fork gouges, Stone

Square-Stemmed and Smith Basal-notched projectile points, Sedalia diggers and drills (Chapman 1975:200). In addition, shaped manos, grooved axes, celts and hammerstones occur, along with numerous choppers. The Sedalia complex is present in the study area. Two of the Late Archaic components noted above for Phillips Spring (23HI216) have been assigned to it. The third has not been given a cultural affiliation but is referred to as the "squash and bottle-gourd zone" (Robinson 1978:2-5). The upper component is not securely dated but a date of 3000 BP is suggested based on Chomko's (1976) investigations. The other component is dated at 3970±70 BP (SMU-419) (Robinson 1978:2). Extensive investigation of the younger component revealed the presence of numerous hearths, pits, lithic workshop areas and post molds indicating that a number of different activities were conducted here (Robinson 1978:39-41). A very unusual feature consisting of a concentration of mussel shell and fire-cracked rock comprised the older Sedalia component. Difficulties of excavation precluded extensive investigation of the feature, but artifacts recovered indicate a range of activities. The concentration of mussel shell, however, is clearly unique and suggests the use of mussels on a scale not in evidence elsewhere in the Pomme de Terre Valley (Kay and Robinson 1978:43-45). The results of the investigations at Phillips Spring and at other spring sites (Wood 1976) show that these locations were used very differently than Rodgers Shelter or other shelter sites. The presence of storage pits at the springs contrasts with their absence at Rodgers Shelter during any time period, as does the presence of cultigens (Robinson 1978:1).

This brief review of the Late Archaic in the study area has brought forward from survey data (Roper 1977; Joyer and Roper 1980) and excavated contexts (McMillan 1976b; Robinson 1978; Kay and Robinson 1978) that the use of the study area was clearly different from the preceding Archaic periods. It is during the Late Archaic that the first intensive use of the study area is indicated by the evidence. The regular production of tool forms other than projectile points, such as Clear Fork gouges and Sedalia diggers, the occurrence of storage pits and hearths, and the presence of cultigens argue for marked shifts either in the environment or in demographic arrangements. These changes correlate well with the shift from Middle Archaic to Late Archaic in other parts of the eastern United States.

**The Woodland Period**

Traditionally, the hallmark of the Woodland period was the introduction of pottery into the material culture. As Roper (1981b:21) has noted, the initial formulation of this taxon was content based and was used to classify assemblages with grit-tempered, sometime cord-marked ceramics, large stemmed and corner-notched hafted bifaces, and the use of mounds for burials. Subsequently, chronological import was attached to the term (Griffin 1946) and this has led to some confusion in the application of the subdivisions of the taxon in certain geographic areas away from the major centers of cultural development in North America. Such is the case in the project area. The subdivision of the Woodland period into Early, Middle and Late, and the application of these terms to assemblages does not work (Roper 1979; 1981b). For example, there is apparently no Early Woodland in the project area, in the sense of the presence of the Black Sand Ceramic complex (Roper 1981b:22). The Middle Woodland period, with its classic manifestations of the various Hopewell complexes is better represented in the study area. Chapman (1965; 1980:27) has noted the presence of "Hopewell" ceramics from some of the

St. Clair County rockshelters. Also noted were a few sherds from a private collection from Monegaw Cave near Monegaw Springs. A few Middle Woodland sherds were also noted from Rodgers Shelter (McMillan 1976b:226). The most frequent and widespread evidence for the presence of Middle Woodland in the project area comes in the form of diagnostic projectile points called Snyders (Roper 1981b:23).

Conformance with the tripartite division of the Woodland in the study area is best with the Late Woodland. The St. Clair County rockshelters had abundant evidence of Late Woodland materials in the form of grit-tempered ceramics and diagnostic projectile points such as Scallorn and Rice Side-notched (Chapman 1980:81). These projectile points are also very common from surface contexts in the study area (Roper 1981b:23-24). Also occurring during this period is the Fristoe Burial Complex (Wood 1967), which are small tumuli that contain both primary and secondary burials, a variety of ceramics, including limestone-tempered plain, grog-tempered and calcite-tempered plain sherds. A wide variety of projectile points have also been found in these tumuli, including Scallorn, Gary, Langtry, Crisp Ovate, Rice Side-notched and Mississippian Triangular, among others (Wood 1967, Chapman 1980:87).

Roper (1979; 1981b) has suggested that it is more appropriate and more productive to look at the Woodland period in this area in a different manner than in terms of the tripartite division normally advanced. Such a view emphasizes that the Woodland period in the study area is not only different than in other areas, but also characterized by an apparent stability of adaptation during much of this period and into what would be called the Mississippian period, if strictly temporal criteria were employed.

It is our opinion that this approach is indeed not only more productive, but also more effective in representing the nature of the prehistoric adaptations in the study area. Roper has defined three complexes for the Woodland period in the study area. This effort has been in response to the vagaries of an archeological record in which stratigraphic sequences have been unclear, absolute dates in short supply, and potentially diagnostic material has not been sufficiently thorough compared with that external to the reservoir area (Roper 1981b:22).

The first complex identified consisted of Snyders points and associated variants. As noted above, these are considered diagnostic of the Middle Woodland elsewhere, but no such import is attached to them here. This complex remains poorly defined in terms of other associated artifacts (Roper 1981b:23).

The second complex defined is marked by the presence of Gary and Standlee (Langtry) points, both of which are contracting stemmed. The chronological position of this complex is unclear. Evidence from two village sites in the Stockton Reservoir would suggest a Late Woodland association (Roper 1981b:23; Pangborn et al. 1967; Calabrese et al. 1969). Other researchers note, however, that these same contracting stemmed forms are known from Late Archaic proveniences (Purrington 1971; Chapman 1980:308-310).

The third complex present in the study area is marked by the presence of Scallorn and Rice Side-notched points. Also associated, in certain contexts such as

rockshelters, are limestone-tempered ceramics with a coarse paste. The temporal position of this complex is apparently better understood, being largely coeval with the Late Woodland (Roper 1981b:24).

Little is known about the Woodland period beyond the definition of these complexes. The lack of absolute dates for sealed context assemblages, the long temporal ranges of diagnostic artifacts, and the fact that most of the sites of this period are known from surface contexts has inhibited development of a site typology and subsequent definition of settlement patterns for this period (Roper 1981b). Concerns for answers to these questions is what guided the University of Missouri's efforts in the study area.

**The Mississippian Period**

The application of this taxon in the study area can be considered to be largely inappropriate. As others have noted, use of this term implies dependence on agriculture in relatively settled villages. The only evidence for this cultural manifestation in the study area is in the form of a very few sherds of type considered to be diagnostic of this period from rockshelters. These include ceramics from the Steed-Kisker, from the Kansas City area, Pomona, from eastern Kansas, and Caddo, from eastern Oklahoma (Roper 1981b:24; Carlson 1977). Wood (1968) has suggested that these remains represent the use of the study area for seasonal hunting by these groups.

**The Historic Indian Period**

The Osage were the Indian group that inhabited the study area at the time of initial contact by Europeans (Joliet in 1673). The Osage were Siouan speakers and were described by Hodge (1907) as consisting of three bands: the Great Osage, the Little Osage and the Arkansas band. The Great Osage and Little Osage lived in western Missouri along the Osage and Missouri Rivers (Carlson 1981). Our concern here will be with their occupation along the Osage, as this is within the study area.

The Osage were considered to be primarily hunters, and they moved prequently over large expanses of territory. Although references to them practicing agriculture vary depending on the time of observation, it is evident that they had minimal dependence on agriculture. They occupied village sites seasonally, and ranged from these places to the west to hunt bison and to the east for deer and bear. At least four Osage village sites are known near the vicinity of the project area. These are 23VE1, 23VE2, 23VE3, and 23VE4 (Chapman 1959). These are on the National Register of Historic Places. They also depended on gathered plant foods (Carlson 1981). The population of the Osage was, at one time quite sizable (5,200 in 1821) but this declined to less than two thousand in 1906 (Carlson 1981: Table 1).

In addition to hunting, farming and gathering, the Osage also traded with Europeans, and for much of the time, functioned as middlemen between the Europeans to the east and other Indian groups to the south and west.

The Osage were gradually displaced to the west as Americans colonized Missouri. They ceded their lands in the Ozark Plateau and were occupying lands in

the Kansas River drainage by the 1840's. In 1870, a reservation was established for them in Oklahoma (Carlson 1981:480).

## REVIEW OF PREVIOUSLY RECORDED SITES

A review of the site files at the Archaeological Survey of Missouri and the offices of the University of Missouri's Truman Reservoir Archaeological Project indicated that a total of 563 sites had been previously recorded within the ten-year floodpool of the Truman Reservoir. These sites are displayed in Appendix D, Table 1. This table presents the following information about the sites. Elevation refers to the lowest elevation of the site. This information can serve as a rough measure of the degree to which each site will be impacted by the periodic flooding of the floodpool. In addition, those sites with low elevations (706 feet) will also be subjected to mechanical effects from the action of waves causing erosion or slumpage. Size indicates the size of the site as it was recorded. Because most of the sites were recorded by the University of Missouri - Columbia, this variable refers to the "area of survey". In areas with dense groundcover, this can mean that the estimate of size is low. The next information category is the nature of groundcover. F refers to cultivated fields; P refers to pasture; O refers to other, and includes settings such as roads, borrow areas, church yards, etc.; W refers to woods or forested areas. The next category is percent of groundcover. Four distinctions were made here: 0-10 percent; 10-50 percent; 50-90 percent; and 90-100 percent. The last category is type of site. The three types are open (0) which refers to the standard lithic/ceramic scatter; shelter(s), which refers to rockshelters; and mounds (M), which refers to burial mounds. If the column is blank for type, it means that the site is open.

### Elevation

Due to the nature of the project, all of the values for elevation fall within the range of 706 feet to 731 feet.

### Size

The range of site sizes present in the previously recorded sites is tremendous. From isolated finds, the size of sites goes up to 300,000 square meters. It should be noted that only a small number of sites are larger than 50,000 square meters. The vast bulk of the sites in this sample range between 1,000 and 10,000 square meters in size.

### Nature of Groundcover

One hundred and twenty three sites (21.85%) were located in forested or wooded areas. Ninety-one sites (16.16%) were located in pastures. Seventy-four sites (13.14%) were recorded in other situations such as roads or borrow pits. The largest number of sites (274, 48.67%) were located in fields. The surveyors were instructed to seek those areas with the best potential for having sites, resulting, of course, in the survey of cultivated fields. This information was of little use in planning the survey strategy because it was determined primarily by sampling considerations independent of the nature of the groundcover.

### Percent of Groundcover

A rough but accurate correlation exists between this variable and the preceding attribute. Woods and pasture almost always have a groundcover of 90 to 100 percent while fields have groundcover of 50 percent or less.

### Type of Site

Almost all of the previously recorded sites were open sites (n=553; 98.22 percent). There were nine shelters and one mound known from the Ten-Year Floodpool. These proportions are roughly in accord with the number of these kinds of sites for the entire sample of sites recorded during the Stage I and Stage II surveys. During those surveys, a total of 19 shelters (1.33 percent) and 12 mounds (0.84 percent) were recorded. This compares with nine shelters (1.60 percent) and one mound (0.18 percent) for those sites within the Ten-Year Floodpool. For planning purposes, then, it was necessary to consider that the majority of sites that would be encountered would be open sites, and that the emphasis for collecting strategies should be directed towards this class of sites. The presence of rock-shelters and mounds was duly noted, of course, but, for planning purposes, these could be largely ignored.

### Cultural Affiliations

The cultural affiliations for the previously recorded sites within the Ten-Year Floodpool were tabulated and are presented in Table 4. As can be seen, each major cultural - historical period is present within this sample. Please note that this tabulation refers to the numbers of components present, as one component. For purposes of designing the survey strategy, this information is of little value, except that the crew members can be (and were) informed that the total range of projectile point types occurs in surface contexts.

**TABLE 4**

**CULTURAL AFFILIATIONS OF PREVIOUSLY RECORDED SITES**

| | |
|---|---|
| Dalton | 7 |
| Early-Middle Archaic | 24 |
| Late Archaic | 29 |
| Woodland A | 43 |
| Middle Woodland | 31 |
| Woodland B | 48 |
| Other | 93 |
| | 275 |

# IV RESEARCH DESIGN

## INTRODUCTION

In order to accomplish the work outlined in the Scope of Work for this project, it was necessary to formulate a research design, or "a plan of study that guides the work." Although specific conceptions about what a research design should be vary (see Goodyear et al. 1978; Schiffer and House 1975), there is clear agreement that the research design does serve, in simple terms, to delineate the information requirements that are needed to fulfill the Scope of Work. One important part of the design is a component that can be called, for present purposes, the scientific research design. The purpose of this component is to provide a basis for the evaluation of the resources in terms of their eligibility for nomination to the National Register of Historic Places. Below, these various information requirements will be presented and discussed, and a scientific research design will be offered.

The primary purpose of the present study was to perform an archeological reconnaissance and survey of sixteen percent of the lands within the Ten-Year Floodpool of the Harry S. Truman Dam and Reservoir. These lands lie between the top of the conservation pool (706 feet msl) and 731 feet msl. Of the lands within the Ten-Year Floodpool, only 60 percent are owned by the United States. The remainder are privately owned. The Corps of Engineers has obtained perpetual flowage easements to permit the periodic inundations that are a major feature of the reservoir operation. This pattern of landownership is the reason that the Scope of Work requires both an archeological reconnaissance and a survey. Shovel testing was not permitted in the easement lands, and this, of course, affects the intensity of the location and evaluation of any resources present. This has meant that the sampling plan had to consider both categories of lands as separate sampling frames (see below). This is pointed out to indicate that, while it may be necessary to sample the two areas differently, it is not necessary for this to affect materially the formulation of the scientific research design. Indeed, it is hoped that the scientific research design be a means for integrating the data gathered during both kinds of survey. In the sections to follow, a scientific research design will be presented and then a sampling plan to gather the requisite data will be offered.

## THE SCIENTIFIC RESEARCH DESIGN

The major research focus of previous archeological investigations in the study area (Wood and McMillan 1976, Roper 1977, 1981a) has been to examine the nature of the prehistoric human adaptations to the prairie-forest border. For our purpose, we can consider the prairie-forest border to be a transition zone between the "true" forest to the east and the Great Plains to the west. The transition zone will be considered distinct from both the prairie and the forest, although the species composition within the transition zone is very similar, if not identical to that of the prairie and the forest (King 1978; and see Chapter I).

Investigations at Rodgers Shelter, as discussed above, have revealed that the study area had been occupied for at least the last 10,500 years (Wood and McMillan 1976; Kay 1978). Paleoenvironmental investigations both within the study area

(King 1976; Haynes 1976, 1977, 1981) and regionally (King 1980) have indicated that the study area has changed dramatically during the Holocene. The principal dynamic has been the formation of the Prairie Peninsula early in the Holocene and its subsequent extension during the Hypsithermal across Missouri into Illinois and Indiana (Wright 1968; King 1980). For the study area, this has meant that environmental change at a given location has been tremendous; from a deciduous oak-hickory forest to tall-grass prairie and then back again. It is also widely held that such environmental change would have also meant that there would have been adaptations to cope with the differences. The investigations at Rodgers Shelter provided an "in-place" look at the character of these changes. Unfortunately, a less than satisfying view resulted due to an occupational hiatus of approximately 1600 years at the height of the Hypsithermal (Wood and McMillan 1976; Kay 1978). At first it was thought that this occupational hiatus was regional in scope, but investigations at Phillips Spring (23HI216) (Chomko 1976; Kay and Robinson 1978) suggested that the area was indeed occupied during that time. This has been further substantiated by investigations conducted by Roper (1981a).

It was the evaluation and elaboration of the model provided by the Rodgers Shelter data that was one of the goals of the initial surveys of the reservoir by the University of Missouri (Roper and Wood 1975; Roper 1977). The survey data gathered was to be used to supplement the model provided by the Rodgers Shelter data. As Roper and Wood suggested, Rodgers Shelter could be considered to be a series of sites, each of which was only one component of the settlement system of which it was a part. The cultural resources surveys were therefore designed to identify the other components of the subsistence-settlement system (Roper and Wood 1975:43). Another goal was to refine further the temporal sequence in the region, because, as noted above, the sequence at Rodgers Shelter was incomplete. These goals were to be accomplished through a study of culturally diagnostic projectile points and the debitage that was associated with them (Roper and Wood 1975:45).

This general approach to the investigation of the study area is reconstructive, that is, it seeks to reconstruct, within a cultural-historical framework, the subsistence settlement systems for each temporal period. This presumably would constitute a baseline for explanation of culture change in the region.

The approach adopted for the present study is different than that discussed above. Rather than seek to reconstruct prehistoric behavior as a prelude to the study of change, we will focus on the investigation of culture process. This shift in emphasis is not intended to be critical in nature, but does attempt to incorporate some of the things learned during the previous surveys of the area and also to take advantage of certain features peculiar to the present study, specifically, the survey of lands well to the west of the lands surveyed by the University of Missouri. As a result, the present study can effectively investigate the geographical patterning of site differences across the transition zone between the prairie and the forest. In addition, the results of the previous surveys have indicated that only a small fraction of the sites located contain culturally diagnostic projectile points or other artifacts permitting assignment to a cultural-historical period (Roper 1977; see above Chapter III). For example, of the more than 1400 sites located during the Stage I and Stage II surveys, only 234 could be assigned to a cultural-historical period. The actual number of sites is lower too, due to the fact that projectile

points from more than one cultural-historical period are found on some sites. The net effect of this is to exclude a sizable fraction from consideration by the research design. Therefore, the research problem discussed below will not depend on assignment of sites to a cultural-historical period. If the information is available, it will be used to supplement the inferences made.

A consideration of the geomorphology of the river valleys of the study area also suggests that most of the sites located will not be older than the surfaces upon which they occur (Haynes 1976; see Chapter I above). This means that it is possible to consider that most of the sites post-date the Late Archaic period. As was noted above, this can be thought of broadly as one adaptational system, although this admittedly simplifies the situation.

The preceding discussion has presented a number of factors in the formulation of the scientific research design. These have all pointed to a problem that is not necessarily dependent on the assignment of sites to various temporal periods. Furthermore, it was suggested that most of the surface sites, at least in the alluvial valleys, will date no later than the Late Archaic period.

## STATEMENT OF THE PROBLEM

The location of the study area on the southern border of the Prairie Peninsula, in the transition zone between the tall-grass prairie to the west and the oak-hickory forest to the east provides an ideal situation in which to examine the nature of forager and collector adaptations as these were presented by Binford (1980). The argument simply states that two dimensions of mobility, residential and logistical, are employed to exploit a resource space. The mix of strategies employed depends on the character of given resource space. The forager adaptation relies most heavily on a residential mobility strategy, which is the movement of both producers and consumers to a foraging locus where they will range short distances from a residential base to exploit resources in the immediate area. A collector adaptation not only has a residential mobility strategy, but also employs a logistical mobility strategy to gain access to resources. Logistical mobility refers to the movement of a special task group away from the residential base, often at great distances, to areas where resources are located. The settlement patterns which result from each type of adaptation are, of course, different.

Forager adaptations have two site types, the residential base and the location. The <u>residential base</u> is defined by Binford (1980:9) as "the hub of subsistence activities, the locus out of which foraging parties originate and where most processing, manufacturing and maintenance activities take place." A <u>location</u>, on the other hand, is defined as "a place where extractive tasks are exclusively carried out" (Binford 1980:9). The forager adaptation is also characterized by the procurement of resources on a daily basis, rather than accumulation of stores.

A collector adaptation produces three additional site types, the <u>field camp</u>, the <u>station</u> and the <u>cache</u>. This complexity in site types is largely due to the fact that collectors generally accumulate and store food for consumption during periods of low production (i.e., winter) and use logistical mobility to procure some of their resources (Binford 1980:10). The <u>field camp</u> is the site "where a task group sleeps, eats, and otherwise maintains itself while away from the residential base" (Binford

1950:10). A station is used by task groups for information gathering, such as observation of game movements (Binford 1980:12). A cache is the place where resources collected by a task group may be stored, either for later retrieval by another task group or to serve as a focus for repositioning the residential bases (Binford 1980:12).

The examples presented by Binford are necessarily extreme examples in which only one strategy is employed. As Binford noted, the ideal foragers are located in equatorial tropical rain forests, while the Nunamiut, who live north of the Arctic Circle, serve as a good example of collectors. But what happens when one moves away from the extremes to the temperate latitudes? As was noted above, that would depend on the specific features of a given resource space, but most temperate latitude adaptations will employ a varying mix of both residential and logistical mobility. These strategies may be manifest seasonally to exploit most effectively the type of resources available. Binford notes that systems which "employ both are more complex than those employing only one and accordingly have more implications for variability in the archeological record" (1980:12).

## THE SAMPLING PLAN

The Scope of Work for this project calls for a 16 percent sample of the lands contained within the Ten-Year Floodpool at the Harry S. Truman Reservoir, near Warsaw, Missouri. This has been defined as those lands which lie between 706 feet and 731 feet above sea level. The site of the Ten-Year Floodpool is approximately 101,000 acres. Approximately 60,000 acres of this is owned by the Government of the United States and the remainder is in private ownership. The former will be referred to as "fee" lands and the latter will be referred to as "easement" lands. In order to meet the requirements of a 16 percent sample of both kinds of lands, it would be necessary to survey 9,000 acres of fee lands and 7,000 acres of easement lands.

One of the principal goals of the survey was to develop a sound and reliable basis for generalization of sample results to the population of sites present in the study area. This is most often attained by the use of a probabilistic sampling design (Binford 1964; Mueller 1974, 1975). Use of strictly probabilistic designs is hampered, however, by the exigencies faced by the normal cultural resources management project (King 1971) which dictate the size and nature of the area to be investigated. Only rarely do these boundaries approximate those that might be chosen if one were to select boundaries based on the requirements of a scientific problem. Another factor which affects the use of strictly probabilistic designs is that the ground surface is often obscured by vegetation or recent alluviation, which makes the examination of the ground surface difficult, to say the least (see McManamon and Ives 1980).

These two factors are not thrown up as obstacles but rather as items which must be considered when designing a strategy to survey a large, irregularly shaped, heavily vegetated area. In addition to these factors, there are a number of factors which must be taken into account prior to outlining the survey design. These are project specific considerations which might not be necessarily relevant in many instances.

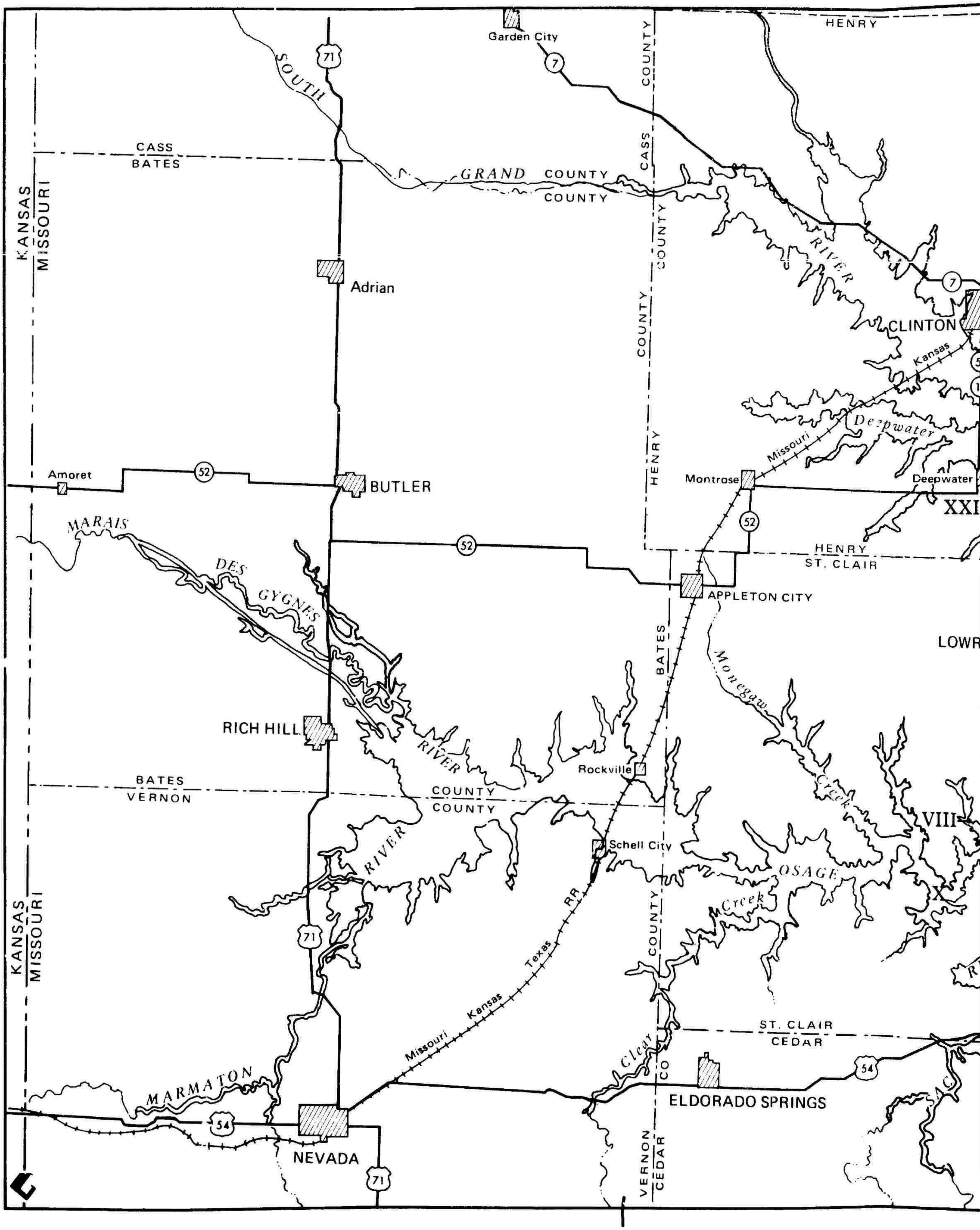
1. The area to be surveyed lies between 706 feet msl and 731 feet msl. The first elevation is the normal elevation of the conservation or multipurpose pool. The upper elevation is defined as the maximum elevation that the reservoir might obtain during a ten-year precipitation cycle. The study area straddles the boundary between two physiographic provinces, the Ozark Highlands and the Osage Plains. This means that, in general, the eastern portion of the survey area is narrow and always adjacent to water. In the western portion, in the Osage Plains, the survey area is quite wide, as much as two or more miles in places, and is flat to gently rolling. These facts condition the choice of both the size and the shape of the sampling unit chosen.

2. As was mentioned above, the study area is in both Government (fee lands) and private (easement lands) ownership. This is relevant to the choice of sampling design because it is necessary to obtain permission to survey the easement lands and to collect artifacts from any sites found there. These facts affect the design of any survey which attempts to be probabilistic in nature.

3. The sample of lands chosen cannot include those which have been previously surveyed. Two previous surveys were conducted by Roper (1977), designated Stage I and Stage II. Stage I was "traditionally structured and performed general reconnaissance" (Roper 1977:88). Stage II "was a stratified random transect survey designated to cover ten percent of the reservoir acquisition area" (Roper 1977:127). A third survey of the public use areas did survey some of the area between 706 feet and 731 feet msl. The net result of these efforts is to have "sprinkled" the study area with patches previously surveyed. These areas are easily delimited on maps and this has been done during the background preparation.

4. The Scope of Work also notes that Dr. Roper's stratification of the survey, done for the Stage II Survey, must be employed during the present effort. The twenty-two strata that were chosen were "natural divisions, each defined by a major stream or stream segment" (Roper 1977:71). Within each stratum, transects one-eighth mile wide were plotted and ten percent of these were surveyed (Roper 1977: Table 10). These transects were from one acquisition boundary across the stream to the acquisition boundary on the other side. The transects that results were of varying length (Roper 1977: Figure 12; see Figure 9).

The purpose of the above discussion was to review some of the factors which have affected the choice of the sampling strategy that follows. With regard to obtaining a representative sample of the sites present in the survey area, these considerations might appear a formidable obstacle. Nevertheless, such constraints impinge on the design of most of the cultural resource management projects done. The challenge, of course, is to develop strategies that accommodate these constraints while also achieving project goals. While it is not possible to choose a strategy and argue effectively that it is the right solution to the circumstances at hand, it is possible to advocate a strategy that employs a judicious mix of both



Garden City
HENRY
CASS COUNTY
SOUTH
GRAND
CASS
BATES
COUNTY
COUNTY
KANSAS
MISSOURI
Adrian
RIVER
CLINTON
Kansas
Deepwater
Missouri
Montrose
Deepwater
XXI
Amoret
BUTLER
HENRY COUNTY
HENRY
ST. CLAIR
MARAIS
DES
GYGNES
APPLETON CITY
LOWR
BATES
Monegaw
RICH HILL
RIVER
Rockville
Creek
BATES
VERNON
COUNTY
COUNTY
VIII
Schell City
RIVER
OSAGE
Creek
RR
COUNTY
KANSAS
MISSOURI
Texas
Kansas
ST. CLAIR
CEDAR
Missouri
Clear
CO
MARMATON
ELDORADO SPRINGS
NEVADA
VERNON
CEDAR

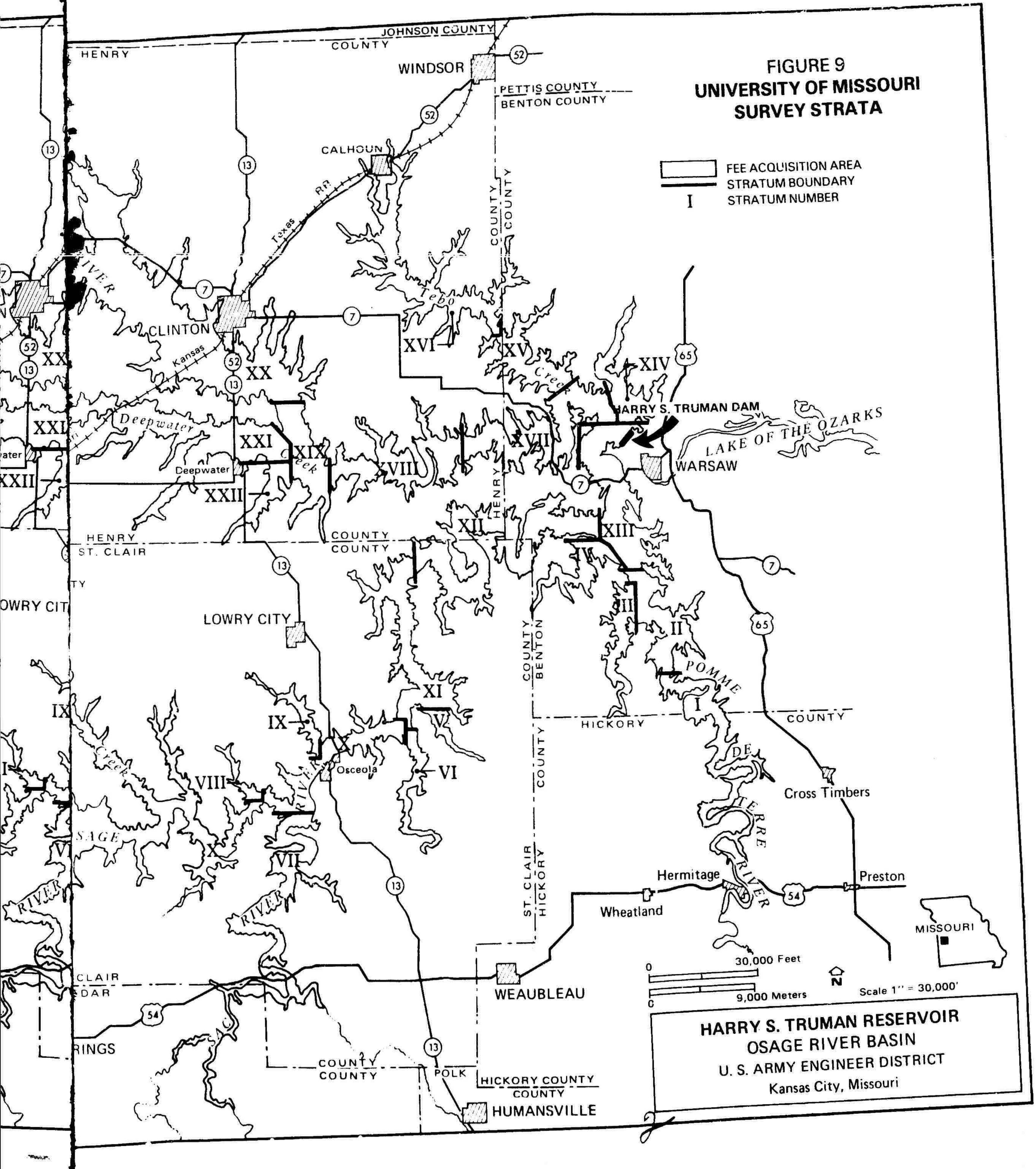



FIGURE 9
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SURVEY STRATA

probabilistic methods and judgment as the means of choosing the areas to be surveyed.

These considerations have led to a decision to view the present effort as two surveys, one of the fee lands and one of the easement lands. The inability to shovel test in the easement lands means that the reliability of the results would not be comparable to the reliability of the survey of the fee lands. In order to achieve one of the major project goals, the estimation of population parameters from a sample, it will be necessary to consider each land category as a separate target population, each to be sampled independently of the other. These samples then can be analyzed and the results of each discussed in terms of what they mean for the study areas surveyed. One benefit is that any errors present in the sampling methodology of either area will be limited to that area.

## THE SAMPLING PLAN FOR THE FEE LANDS

The fee lands were sampled by using Roper's twenty-two strata as a first means of subdividing this area. The use of this stratification has resulted in the definition of twenty-two subpopulations from which twenty-two samples have been taken, one from each. While it might be possible to quibble with the notion that these "strata" are really "clusters" (see Blalock 1972), what is most important is that these strata exist and have been sampled by means of a ten percent transect survey (Roper 1977:69-75). At that time, the study area included all area owned or scheduled to be acquired by the government for this project. In the present instance, it is permitted to survey only the lands that lie within the Ten-Year Floodpool. The shape of this area is extremely irregular, precluding the use of any standard shaped survey unit. Because of the practicalities involved, it was necessary to establish a minimum area for the sample unit at 80 acres. This size was chosen because it can be reasonably surveyed by one crew of two persons in a day. Secondly, with an area of this size, it was possible to plot survey units well up the reach of a tributary where attempts to plot a larger sized unit would fail because of lack of available land within the study area. It could be anticipated that such problems might be frequent, given the extreme irregularity of the shape of the study area. In this survey, we held the size of the sample unit constant at 80 acres and varied the shape to follow the contours of the Ten-Year Floodpool.

What strategy can be employed to select the individual sample units? We employed the Township, Range and Section coordinate system in order to select randomly "candidate sections." A list of all sections containing lands in the Ten-Year Floodpool within each of the twenty-two strata was compiled. In order to qualify for this list, a section need merely touch the study area. We were not interested in whether or not the section so considered contained enough land for an 80 acre sample unit. Nor were we concerned that substantial portions of that section have been previously surveyed. The next step was to use a table of random numbers and select a simple random sample of "candidate" sections with replacement, meaning that a candidate section can be chosen more than once. This is done to facilitate statistical manipulation by keeping the finite population correction factor as close to unity as possible (see Loether and McTavish 1974:44-46 for a discussion). In the event that a section is chosen more than once, a additional draw will be made to insure that the required 15 percent coverage is still attained.

Depending on the vagaries of the draw, the sampling fraction could be increased "artificially" from the 15 percent figure.

Once a candidate section was chosen, it was examined to see if it contained 80 acres of land within the study area boundaries that were not previously surveyed. Keep in mind that all sections that contain a portion of the study area were included in the sample, regardless of the size of that portion. This decision was made to reduce the amount of judgment employed in the choice of a sample unit. An additional advantage of this strategy is that it gives every part of the study area an equal chance of being selected, without prior exclusion due to requirements of the sampling design and contractual limitations. A list of all sections drawn for the sample was made and kept. This allowed independent verification of the reasons for excluding any candidate section. Sections that did not contain 80 acres of surveyable land were excluded.

If a candidate section contained 80 or more acres of land that could be surveyed, then these were gridded off. If there was more than one potential sample unit within a section, these were numbered, and one was be chosen randomly by the toss of a die or pair of dice, as appropriate. Because of the irregular shape of the study area, the 80 acre sample units were also of different shapes, both within and between candidate sections.

This procedure also possesses advantages with regard to candidate sections that contained areas that have previously been surveyed (indicated either by the presence of sites or the plot of a transect from the Stage II survey of Roper (1977). If such a section was drawn, it too was gridded into 80 acre sample units. This unit was not resurveyed but included in a second sample for purposes of later analysis.

In order to survey a 15 percent sample of this zone, it was necessary to examine 113 sample units, each 80 acres in size (80 x 113 = 9040). These sample units were apportioned according to the strata used by Roper (1977). This was done by taking the percentage of the total amount of land acquired that is present in each stratum and multiplying it by 113, the number of sample units desired. The results are displayed in Table 5. It will be noticed that this procedure only allocated 111 sample units. The number in parentheses indicates the addition of two sample units needed to reach the total of 113. While these choices are arbitrary, they do smooth out some of the inconsistencies that resulted from rounding off. Adding an additional sample unit to Stratum VI maintained the areal proportion of sample units when Stratum VIII was considered. A similar argument applies for the second choice, Stratum X, when Strata I and XI were considered.

In order to draw the sample of candidate sections for each stratum, it was necessary to number sequentially all of the sections that qualified for inclusion. One of three tables of random numbers were used. These too were assigned numbers (1, 2, 3) and one table was chosen randomly by the roll of a die for each stratum. This minimized possible "autocorrelation" problems that might result from the use of a single table for 23 separate draws from subpopulations not likely to be greater than 25 elements. The tables used are found in Blalock (1972), Loether and McTavish (1974) and Thomas (1976). It should be remembered that this sample was drawn with replacement, which meant that the same section might be chosen more than once. If this is so, and the section cannot be excluded, then additional sections

## TABLE 5

## SURVEY STRATA AND SAMPLE UNITS

| Stratum | Name | Area in Acres | % | x113 | Number of Units Chosen | |
|---|---|---|---|---|---|---|
| I | Middle Pomme | 9,498.32 | 5.74 | 6.49 | 6 | |
| II | Lower Pomme | 4,761.19 | 2.88 | 32.5 | 3 | |
| III | Little Pomme | 4,172.13 | 2.52 | 2.85 | 3 | |
| IV | Hogles Creek | 3,908.41 | 2.36 | 2.67 | 3 | |
| V | Bear Creek | 1,566.96 | 0.95 | 1.07 | 1 | |
| VI | Weaublean Creek | 2,087.26 | 1.26 | 1.42 | 1 | (2) |
| VII | Sac River | 4,752.55 | 2.87 | 3.24 | 3 | |
| VIII | Salt Creek | 1,049.25 | 0.63 | 0.71 | 1 | |
| IV | Gallinipper Creek | 1,582.76 | 0.96 | 1.08 | 1 | |
| X | Upper Osage | 10,939.07 | 6.61 | 7.47 | 7 | (8) |
| XI | Upper Middle Osage | 9,542.72 | 5.77 | 6.44 | 6 | |
| XI | Lower Middle Osage | 17,493.41 | 10.57 | 11.94 | 12 | |
| XIII | Lower Osage | 10,235,73 | 6.19 | 6.99 | 7 | |
| XIV | Little Tebo | 5,765.46 | 3.49 | 3.94 | 4 | |
| XV | Lower Tebo | 6,979.76 | 4.22 | 4.77 | 5 | |
| XVI | Upper Tebo | 10,545.41 | 6.37 | 7.20 | 7 | |
| XVII | Lower South Grand | 13,400.02 | 8.10 | 9.15 | 9 | |
| XVIII | Middle South Grand | 12,879.48 | 7.79 | 8.80 | 9 | |
| XIX | Continuance Area | 6,325.61 | 3.82 | 4.32 | 4 | |
| XX | Upper South Grand | 16,580.41 | 10.02 | 11.32 | 11 | |
| XXI | Deepwater Creek | 8,835.95 | 5.34 | 6.03 | 6 | |
| XXII | Cooper's Creek | 2,529.00 | 1.53 | 1.73 | 2 | |
| | | 165,431.49 | 99.99 | | 111 | (113) |

were drawn to insure that the total of 113 unsurveyed sample units was reached. This procedure was employed when sections that have been previously surveyed were drawn. A record of these sections was kept to be used to create another sample for analysis purposes.

## THE SAMPLING PLAN FOR THE EASEMENT LANDS

The sampling plan for the easement lands follows the same general process to derive a sample of candidate sections.

It was mentioned above, that there are some constraints when surveying on the easement lands. Permission is needed to survey a parcel of land as these lands are still in private ownership. Furthermore, permission is needed to collect artifacts from sites on easement lands. Third, no subsurface testing is permitted. This last factor is a very important one, given that much of this area is heavily vegetated. This would mean that the chances of site discovery are tremendously diminished.

In order to cope with this, it was decided to use 160 acre sample units in this zone. With units of this size, the chances were greater that more than one site per sample unit would be found, aiding in the analysis of the results. With 160 acre sample units chosen, 44 sample units would be required to survey the 7,000 acres which represents a 15 percent sample of the easement lands within the Ten-Year Floodpool.

The easement land portion of the survey area was divided into only two strata, the Osage River stratum and the Lower Grand River stratum. To stratify the area according to the way that the fee lands were stratified would result in the creation of a dozen or more strata of greatly differing sizes. The fact that each stratum would have to have at least one sample unit, would result in the over-representation of the smaller strata and the consequent underrepresentation of the larger strata. The two strata were, in every sense of the words, "natural divisions" as they are entirely separate drainages. These strata were measured in order to insure that they were proportionally sampled.

The choice of candidate sections was accomplished as it was for the fee lands. First, a list of sections that were present within each stratum was compiled and then sequentially numbered. A table of random numbers was used to draw a simple random sample with replacement of candidate sections. Each section was examined to see if it contained a minimum of 160 acres within the study area. If so, it was retained. It was at this juncture that a substantial deviation from the fee land sampling plan occurred. The choice of sample units was biased to those areas with the best chance of having good surface visibility. It must be remembered that a major goal of the survey was to develop some basis for estimating the nature and extent of the prehistoric resources present. Given the constraint against subsurface testing, the field strategy should actively cope with the potential difficulties of attempting to find sites in heavily vegetated areas. For this reason, candidate sections which were heavily vegetated were not included in the sample. Refusal of permission to survey a parcel by a landowner meant, of course, that that parcel was excluded. It was also decided to exclude any parcel for which permission to collect was not given. No provision was made to choose a sample unit from a

candidate section when more than one potential sample unit existed. This was done in order to give the field personnel more leeway in the choice of areas to be covered once they arrived at a candidate section and examined it firsthand. Regardless of the area chosen, it was delineated on a map.

The sampling plan which has been described above attempted to consider a number of factors, some contractual, some "historical," in order to develop a strategy that ensured that the goals of this project were met. The sampling plan for the fee lands was a stratified random sample of candidate sections within each stratum. An 80 acre sample unit was selected from each candidate section chosen, and the total sample was 113 sample units. This strategy was adopted because it permitted the random selection of a space regardless of its size or shape, as long as it occurs within the Ten-Year Floodpool. There were practical considerations that enter in to determine which were actually chosen (80 acre minimum, for example), but these were applied after the space was chosen. Within some confidence limits, the sample units chosen constituted a representative sample of the proportion of landforms and tributary ranks, among other things, in the fee lands. In the easement lands, the same general strategy was chosen, except that it was noted that the sample would be biased towards areas with good surface visibility. This might not be good sampling, but it was good sense, given that a goal of the survey was to estimate the parameters of the population of sites present. This was best accomplished by analyzing a large number of sites rather than a very few. The choice of a large sample unit for the easement lands was made in order to enhance the probability of finding more than one site in a sample unit.

# V METHODOLOGY

## FIELD METHODS

The field methods were designed and proposed for the survey of the Ten-Year Floodpool in the Research Design for the Reconaissance and Survey (Taylor 1980). This section is a discussion of the implementation of that methodology and the changes made to it during the field study. Basically, the field methods can be separated into two units: those strategies oriented toward a survey of the sample units; and the different types of site collection alternatives. Initially however, it is important to discuss the more logistical aspects of actual survey.

### Field Crew and Equipment

The field crew itself varied during fieldwork in from two to six people. There was set crew size for survey purposes. The number depended on the size of sample units, the number of sampling units located in one general area, and whether the area was fee land or easement land. During the earlier portions of the survey, while on fee lands, two person crews were used to conduct surveys. Later in the season all members of the crew were employed to cover large tracts of land in the easement areas.

Each crew was furnished with the following equipment while conducting surveys:

1. Vehicle: At various times the following vehicles were used: a 1977 Chevrolet Blazer with four wheel drive automatic transmission; and a Chevrolet Citation with automatic transmission.

2. Safety: Each crew had at its immediate disposal a Johnson and Johnson Family first aid kit; a Johnson and Johnson Industrial first aid kit was also available, as well as Cutter Laboratories snake bite kits.

3. Recording forms: Sample unit forms, site forms, random number tables, photograph forms and field note books were carried.

4. Photographic equipment: A Nikkormat FT2, a Pentax K.1000 and Pentax ME were all used during the course of the survey.

5. Locational Aides: A Suunto WE-40 compass, Corps of Engineers Real Estate Maps and USGS Quad Maps were employed to facilitate location of sample units and on-the-ground survey locations for site recording information.

6. Subsurface testing: shovels, trowels and hand held screens with 1/4 inch mesh were used to test for sites in areas of dense surface vegetation.

7. Collection aids: Ziplock heavy duty plastic bags, paper bags, surveyors flags, flagging tape, metal clip boards, and a 5 meter rope and chaining pins, were used for collection purposes.

8. Water and food stored in coolers

9. Packs: Two rucksacks were used to carry most of the small equipment.

**Survey of Fee and Easement Land Sample Units**

The principal method used to inspect units was pedestrian survey. The fee land sample units usually had a mixture of areas with a wide range of ground vegetation cover. The easement lands, however, were restricted to areas of high surface visibility due to constraints on subsurface testing. As a result, methods used to survey these two types of land are slightly different.

Fee land surveying conditions varied from freshly plowed and planted fields to forested areas and pasturelands. Two methods were employed to inspect efficiently this variety of conditions. On land which was deemed by crew members to have sufficient ground visibility a visual inspection was conducted. Surveyors were spaced at intervals of 25 meters to 50 meters, dependent on the amount of groundcover; the less surface area visible, the closer the spacings. The field would then be traversed as many times as needed, in order to ensure the entire area had been inspected. If necessary, directional control was maintained with the use of a compass.

Subsurface testing was conducted in areas with a ground vegetation cover of between 50 and 100 percent. The testing procedure was similar to surface survey. Surveyors were to be no more than 50m apart, testing an entire area using a series of transect passes. Shovel tests were spaced from 30 to 50 meters apart. The distance was dependent on the amount of groundcover. In those areas with a high percentage of surface vegetation cover, shovel tests were closer together. The shovel tests were either dug to 50 cm or until a rocky substrate precluded further digging. All fill from shovel tests was screened through a quarter inch mesh.

During the course of shovel testing procedures all opportunities were taken to inspect patches of exposed ground or roads adjacent to woods or pasture. Often this technique combined with shovel testing was most successful in identifying a site. It was useful, as well, to use compasses during shovel testing to maintain the proper direction during each pass through a heavily vegetated area.

Easement land survey was, as stated before, only conducted on plowed or planted agricultural land because shovel testing was not permitted. Therefore, these lands were chosen to increase the probability of finding sites. A walkover of easement fields was the same as the method employed during inspection of fee lands with good to excellent surface visibility.

After the survey of a sample unit, a Sample Unit Form (see Appendix E, Figure 1) was completed. This form helped summarize information relating to the landform, slope, location of water sources, and information about the survey methods employed and a list of the number of sites found. These forms were then stored in the field laboratory. Lists were made of all completed units and those units yet to be surveyed. This procedure ensured an orderly progression of the work.

## Site Collection Procedures

The goal of site collection techniques was to preserve as much information as possible concerning location, density of artifacts and associations of artifacts. The first step in collection was a determination of the extent of the site and the nature of the artifact distribution present (i.e., sparse scatter, clusters, etc.). The approach, whether the site was found in a shovel test or during walkover survey, was to be as methodical as possible to ensure an efficient collection of the site.

Site extent was determined by bracketing the first shovel test with a number of additional tests to reveal artifacts. All subsequent tests were oriented in cardinal directions from the first shovel test in 25 meter intervals. Shovel testing continued until no further material could be found. In order to ensure that surveyors had defined site boundaries properly, a final series of tests were placed halfway between the last test and the one dug prior to it. As with the surveying procedures, each shovel test used to delineate site boundaries was dug to at least a depth of 50cm and the contents were screened through a quarter inch mesh. Surface collections also were conducted on sites found through shovel testing if any areas of good surface visibility were present.

Artifacts recovered from each shovel test were bagged individually. Also placed in the bag with artifacts was a provenience card noting the Stratum, Sample Unit, field site number, date, the shovel test number, the provenience number, collection comments and names of the surveyors. Surface collections from these sites were usually given one general provenience and bagged with the same information.

When sites were discovered while conducting survey of open areas, such as plowed fields, site extent was determined by an intensive inspection of the area. During the determination of site extent, surveyors tried to flag all artifacts present on the site. Usually, however, artifacts were too abundant to flag individually so concentrations were indicated by flagging. An effort also was made to identify and mark lithic "tools" (bifaces, unifaces, flake tools or hafted bifaces) at this time.

After site boundaries had been determined and artifact distributions closely inspected and flagged, a collection strategy was selected. The basis for sampling strategies was set forth by Taylor (1980) in the Research Design for the Reconnaissance and Survey. In the research design, two strategies were discussed. Each was oriented according to the shape of an artifact scatter of a site.

On those archeological sites that were represented by a more oval shaped distribution, a circular strategy was employed. The procedure was as follows. The center of the scatter was identified and served as the point of origin. The site was then divided into four quadrants: 9°-90°; 91°-180°; 181°-270°; 271°-360°. Once this was done a random vector was selected, with the help of a random numbers table, for each of the quadrants. For example, a series of 59°, 96°, 196°, 350° could be selected. Usually only four vectors were selected, but in instances of heavier concentrations of artifacts more could be used. The vector would extend from the center of the site to the edge, and on this line one randomly selected collection unit was assigned for every 50m segment. For instance if the radius of a

circular site was 150m, three collection units would be selected. These collection units were to be the primary means of sampling a site.

It was noted (Taylor 1980) that it was important to control the size of individual sampling units in order to permit a statistically valid sample size. In practice, this was implemented through the use of a five meter long rope with a nail attached to one end and at 1 meter intervals along its length. At each assigned collection unit the nail was pushed into the ground, and the surveyor then proceeded to cover an area delineated by the 2m length. The goal was to collect between 30 and 50 artifacts, a number that permitted reliable use of descriptive and inferential statistics (Blalock 1972). If less than this were found the crew member would proceed to the 3m length and so forth until they had reached the 5m length, at which time all artifacts that fell within the boundaries set by the rope were collected, or he/she had collected 35 pieces. It is also important to point out that all artifacts were collected within the last length of the leash, i.e. one did not stop in the 3m length just because 35 artifacts were collected.

Each collection unit was assigned a provenience number and all its artifacts were bagged together. Also placed in each individual bag was a provenience card with information relating to stratum number, sample unit, field site number provenience number, collection comments (in which the length of collection leash used was noted), date and the names of surveyors.

Archeological sites with more linear distributions were sampled using the transect strategy. The procedure for this technique is as follows. The width and length measurements of the site were noted. A baseline was then created across the width of the site. A random number was selected for each 15m segment along the baseline. This number represented the origin of the transect, which was to reach across the length of the site. Having already measured the long axis of the site, each transect was broken into 50m segments. For each segment a random number was chosen. For example, if a transect was 250 meters in length, five random numbers would be chosen. One number between 0 and 50 would be the first, another between 51 and 100 would be second, and so forth until all the required numbers were selected.

The collection of the linear transect units was carried out in the same manner as described for the circular strategy. Each collection unit would be assigned a provenience number and bagged with an index card listing field site number, collection unit designation, and other important bookkeeping information (as diameter of the collection and the name of the surveyor).

During the project several points arose that required amendments and additions to the field collection methods designated in the research design. An example of this would be the need to collect temporally diagnostic artifacts.

It was decided that individual artifacts, temporally diagnostic ones as well as other tools, would be plotted in relation to the nearest collection unit. Those artifacts were mapped by using a compass to determine the direction to the collection unit. Once this was known, the distance was paced and this information was transferred to a map. Each artifact individually plotted was given a unique

provenience number and was bagged with a card describing all appropriate bookkeeping information.

Anoth... problem arose concerning how small sites were to be sampled. Initially, crew members tried to subject all sites to either the linear or circular strategies. It soon became apparent that, in instances where only six or seven flakes represented a site, the use of those strategies was inappropriate because they would not result in the collection of a viable sample. The solution to this problem was to employ a total collection strategy on sites with less than 100 flakes.

In order to preserve information about spatial distributions within the total surface collection, the site was divided into a number of collection loci. Smaller sites, those with less than 35 flakes, were collected as one locus. Any possible number of permutations was possible using the locus collection, depending on the situation. Some examples are as follows. In instances where there was a relatively large amount of flakes found, but not enough to constitute small reliable sample, a number of loci could be subjectively assigned to retain some spatial information. When scatters could be associated with some sort of land form, such as a knoll on the floodplain, they were designated as a locus. Situations also ocurred on sites that were being sampled with one of the two primary collection strategies, in which concentrations were collected as one locus. The use of the surface collection locus was primarily an effective way to collect those sites too small to be included in either the transect or circular collection strategy.

The final part of any field collection was the completion of a site form (see Appendix E, Figure 2). The site form was designed to describe the location, landform, associated water sources, collection information and types of artifacts found. A detailed map of the site was also drawn on the site form. Completed forms were stored in the laboratory.

## LABORATORY TECHNIQUES AND ARTIFACT ANALYSIS

The Laboratory procedures were designed to insure that all artifacts were properly provenienced, analyzed and accounted for. This process, which began in the field, can be viewed as a progression of tasks undertaken to achieve the ultimate goal of interpretation of the archaeological record. This section is a discussion of each individual stage, and its function in the overall scheme, meant to ensure that the analysis flowed smoothly, and its ultimate conclusions -- the report and storage of artifacts in an official repository (Table 6).

The first stage in the analysis process was conducted in the field lab. Each day that sites were collected, an inventory was taken for all materials recovered (See Appendix E, Figure 3). This inventory included a list of all sites found, proveniences assigned to each site and the number of bags used to collect each provenience. This insured that all artifacts could be accounted for in the future and could serve as a source of valuable information if some problem were to arise.

The second stage, also conducted in the field, centered on the transfer of artifacts to the main laboratory in Jackson, Michigan. In this stage a list was added

**TABLE 6**

**PROGRESSIVE STAGES OF LABORATORY PROCEDURES AND LITHIC ANALYSIS**

ARTIFACTS COLLECTED FROM SITES

↓

STAGE 1

Inventory of Sites Made on Field Laboratory Form

↓

STAGE 2

Artifacts Boxed Up and Sent to the Jackson Lab

↓

STAGE 3

Artifacts Washed

STAGE 4

Sites Separated

| | |
|---|---|
| Category 1 < 50 Artifacts | Category 2 > 50 Artifacts |
| ↓ | ↓ |
| STAGE 5 | STAGE 5 |
| Lab Provenience Numbers Assigned<br>Artifacts Sorted<br>Tabulation of Artifact Classes<br>Lab Control Form Completed<br>Analysis | Lab Provenience Assign[illegible]<br>Artifacts Sorted and Numbered<br>Lab Control Form Completed<br>Metric Analysis Completed |
| ↓ | ↓ |
| Report Appendix | Computer Analysis |
| ↓ | ↓ |
| STAGE 6 | Report |
| Sent to State Repository | STAGE 6 |
| | Sent to State Repository |

to the field lab catalog of the box number into which each site a collection was placed. This list was also written on the outside and included on an enclosed list on the inside of each box. The dates when boxes were shipped and received were also included in the inventory to insure all items were accounted for in Jackson.

Once the artifacts reached Jackson, stage three was implemented. This part of the process called for all artifacts to be washed and any damaged bag provenience labels replaced with new ones. The artifacts were rebagged and returned to their prospective boxes to await analysis which began after the field season.

Stage four began the actual analysis of the artifacts. At this time each site was placed into one of two general categories. The first category is an incorporation of all sites with a majority of the proveniences with less than 40-50 items. These sites do not meet the requirements for the minimum number of observations required for a reliable use of statistics (Blalock 1972). All of the artifacts in these sites were tabulated and appear in Appendix B. The remaining bulk of the sites found are included in the second category. The metric analysis was conducted on artifacts from those sites.

**Artifact Analysis**

The fifth stage of the laboratory process was the analysis of materials found during the survey. These artifacts, as stated above, were analyzed either by a tabulation of artifact classes, or a metric analysis. The initial procedures developed for the handling of both categories of sites. however, is the same.

Once a site was selected for analysis, the first step was to assign Laboratory Provenience numbers to all proveniences designated during survey. Those numbers were created so that the proveniences collected in all the sites would have a unique number. This was necessary to allow the manipulation of those data in the computer analysis and permit the smallest units of collection to be documented. Lists of the assigned numbers and their appropriate site number and provenience description were kept on the laboratory provenience form (Appendix E, Figure 4). The next step was to sort the artifacts present into nine categories, including hafted bifaces, bifaces, unifaces, utilized flakes, modified flakes, cores, and other lithics, and ceramics. These classes are described in the following text (from Taylor 1980).

**Hafted Bifaces**

This class is composed of traditionally identified projectile point forms and all other bifacially worked tools that have haft elements. Two types of analysis were conducted for this class of artifacts. The first was a standard typological analysis employing all of the necessary references to establish types. Roper and Piontkowski (1977) and Chapman (1975) served as the initial basis for beginning this phase of the analysis. The results of this analysis permitted the assignment of sites to various cultural-historical entities that have been proposed. The second type of analysis was a distilled version of Binford's (1963) attribute list for the analysis of hafted bifaces.

Bifaces: This category encompasses a wide spectrum of shapes and sizes of bifacially chipped stone tools, which do not have an apparent haft element.

Unifaces: This artifact class is composed of flake tools that exhibit intentional retouch modification from a single direction and at least one resharpening episode. These artifacts were analyzed according to the analysis of Paleo-Indian unifaces developed by Wilmsen (1970).

Utilized Flakes: This artifact class is composed of those flakes which exhibit macroscopic evidence of utilization, but are not marginally retouched.

Modified Flakes: This artifact class is composed of wide range of such traditional tool types such as awls, gravers and spokeshaves, in addition to other flake tool forms with bifacially or unifacially retouched margins where the flake scars do not extend more than 10 millimeters onto the face of the tool or flake.

Cores: Cores can be defined as piece of siliceous stone which does not have a bulb of percussion and which exhibits at least one surface from which one or more flakes has been removed (Chapman 1977:375).

Debitage: This class is composed of the debris that results from manufacture and maintenance of chipped stone artifacts and the odd assortment of angular waste or shatter that inadvertently results from those activities. The attributes observed include: condition, that is, is the flake whole or broken; reduction type, that is whether the flake is primary, secondary or tertiary; flake type, that is, flake or bifacial retouch, chunk, or other; raw material type; and size class.

Other Lithics: This category includes lithic materials not falling into the above categories. Some examples of other lithics are pitted cobbles, ground stone tools (pieces of stone exhibiting alteration of one or more surfaces by means of grinding or polishing), pieces of hematite and fire-cracked rock.

Ceramics: No ceramics were found in surface contexts.

After all artifacts had been sorted each item was numbered in consecutive order until all artifacts were labelled. This procedure ensured that any individual artifact could be easily relocated. The total counts of artifact class within a provenience, and the consecutive numbers used in each category were recorded on another form designed to keep a labroatory control record of the contents of each provenience unit (see Appendix E, Figure 5). Also noted on this form was the laboratory provenience number and the Official State o. Missouri site number. At this point the analysis, counts and a tabulation of artifacts from category one and the metric analysis of all category two artifacts were conducted. Metric analysis was conducted by artifact classes (note that unifaces, modified and utilized flakes were included on one form). After the artifacts were analyzed they were returned to their original bags, except for hafted bifaces which were separated later to be categorized by cultural historic affiliations. Site collections were again returned to boxes to await the final stage of the laboratory process, curation at a state agency. The Artifact Coding forms were punched onto computer cards and a computerized statistical analysis was conducted on each artifact class. This procedure is described in Chapter VI.

# VI RESULTS OF SURVEY

A 16 percent sample survey of the lands within the Ten-Year Floodpool of the Harry S. Truman Lake was conducted by Commonwealth Associates during the periods of May 19, 1980 to August 2, 1980 and from November 7, 1980 to November 21, 1980. As required by the Scope of Work for this project (Appendix A) and as noted above in the Research Design, there were two categories of land to be surveyed. The first of these can be referred to as "fee" lands, or those lands owned by the Government of the United States. The second category is the "easement lands", or those lands for which the Government of the United States has obtained perpetual flowage easements to permit the periodic inundation of these lands by water impounded by the Harry S. Truman Dam.

There are two requirements of the Scope of Work that are relevant to the development of the survey strategy. The first of these is that the survey strategy employ the stratification of the survey area developed by the University of Missouri (Roper 1979). This stratification divided the fee lands into 22 strata (Table 8). Each stratum was a segment of a large river, such as the Osage, or a tributary stream, such as Gallinipper. As Table 8 shows, this results in survey strata of widely varying sizes. The second requirement of the Scope of Work that is relevant is that the present survey be restricted to those lands within the Ten-Year Floodpool that have not been previously surveyed by owners from the University of Missouri.

The manner in which the Stage I survey was conducted (see Roper 1979) and the survey of the public use areas has meant that the amount of land within the various strata of the Ten-Year Floodpool surveyed has been disproportionate to the percentages indicated in Table 7. Also contributing to this problem is the topography of the survey area which means that the lands within the Ten-Year Floodpool are not distributed in the same proportions in each of the survey strata.

## Fee Lands

With the above considerations in mind, it was necessary to determine which portions of each stratum had been previously surveyed. In the instances of the Stage II survey (Roper 1979) and the Public Use Area Survey (Roper 1981d), this was a relatively straightforward procedure because the areas surveyed during these operations were delimited on U.S.G.S. quadrangles in conjunction with the development of background information. More problematical was the determination of the survey coverage of the Stage I survey. As described by Roper (1979), the survey strategy can be best described as opportunistic with the individual surveyor's judgment being the prime determinant of the areas to be surveyed. The Stage II ten percent stratified random sample survey was, in fact, conducted to overcome the principal shortcoming of the Stage I survey, its unrepresentativeness (Roper 1977a). In the absence of any other information, it was decided to designate as previously surveyed only those areas in which sites were found. When site clusters were found, the entire area was considered to be previously surveyed.

Once the previously surveyed areas had been delimited, the amount of area unsurveyed within each stratum was measured. This was done by plotting the

boundaries of the study area (the 706 foot and 731 foot contours) onto the U.S.G.S. quadrangles from the Real Estate Segment maps. Acreage was measured by the grid-dot technique. This method employs a grid of dots which is laid over the area to be measured. To determine the acreage, one counts the dots and multiplies by 10. The results are displayed in Table 9. It should be noted that the acreage estimates for the Stage I, Stage II and Public Usage Area surveys are for only those lands within the Ten-Year Floodpool.

A comparison of the percentage of land within the various strata for the fee lands as a whole (Table 5) and for the Ten-Year Floodpool (Table 7) illustrates the disproportionate relationship discussed above. For example, consider Stratum 12. For the study area as a whole, it contains 11.94 percent of the area, but for lands within the Ten-Year Floodpool, only 6.58 percent stratum 20. Stratum 20 is equally striking. For the study area as a whole, it contains 10.02 percent of the land, but 19.36 percent of the land within the Ten-year Floodpool.

The sample units within each stratum were chosen in the following manner. First, a list of candidate sections was compiled. This was done by simply determining which sections occurred within the Ten-Year Floodpool. Once this list was complied, the sections were individually numbered from one to n. As was noted above in the research design, the selection of each section was random and was accomplished by means of a random number generating program used with a Hewlett-Packard 34C calculator. This program is useful because a new seed can be programmed in for each draw. A new seed was used for each stratum. As a section was chosen randomly it was map-inspected to determine if it had more than 80 unsurveyed acres in any one contiguous parcel. If it did not, it was discarded and another section was chosen. This process was continued until the requisite number of sample units was chosen. In a number of strata, it became necessary, because of the nature of the previous survey or topography, to locate more than one sample unit within an individual section. When this needed to be done, the area within the section was divided into 80 acre parcels. Each of these parcels was numbered and chosen randomly as described above. It should be noted that this procedure was used when there was more than one potential sample unit location within each section. The entire thrust of this exercise was to minimize the amount of judgment employed to determine areas to be surveyed. In a number of instances, however, it became necessary, to "handpick" sample unit locations. This was due principally to the requirement to have a minimum of 80 acres in each sample unit. This requirement was thought to be desirable for a number of reasons. The first was logistical. Given no restraints on sample unit size, an unwieldly and large number of sample units was possible. This criterion served to disperse the locations of the sample units. A second reason was to force us to adopt sample units of widely varying shapes. Some of the sample units are literally cliffhangers, being located as they are along the shore of the lake. The absence of a standard sample unit acreage would have made the choice of these locations less likely.

**Easement Lands**

In the original research design (Taylor 1980), it was proposed to employ a stratified random sampling procedure to locate the sample units. To accomplish this, two additional strata were created. Stratum 23, South Grand Easement is comprised of those lands within the Ten-Year Floodpool for which the Govenment

TABLE 7

SURVEY COVERAGE WITHIN THE TEN-YEAR FLOODPOOL

| Stratum | Stage I | Stage II | Public Use | Unsurveyed | Total | % | 112 |
|---|---|---|---|---|---|---|---|
| 1 | 265 | 620 | 314 | 2,920 | 4,119 | 6.84 | 7.66 (8) |
| 2 | 0 | 79 | 338 | 799 | 1,216 | 2.02 | 2.26 (2) |
| 3 | 501 | 81 | 195 | 733 | 1,510 | 2.51 | 2.81 (2) |
| 4 | 0 | 147 | 0 | 856 | 1,003 | 1.67 | 1.87 (2) |
| 5 | 70 | 106 | 0 | 866 | 1,042 | 1.73 | 1.94 (2) |
| 6 | 44 | 129 | 0 | 633 | 806 | 1.34 | 1.50 (2) |
| 7 | 93 | 323 | 76 | 2,871 | 3,363 | 5.59 | 6.26 (6) |
| 8 | 30 | 119 | 0 | 461 | 610 | 1.01 | 1.13 (1) |
| 9 | 10 | 110 | 0 | 730 | 850 | 6.45 | 1.58 (2) |
| 10 | 28 | 471 | 132 | 3,249 | 3,880 | 6.45 | 7.22 (7) |
| 11 | 41 | 295 | 134 | 2,304 | 2,772 | 4.61 | 5.16 (5) |
| 12 | 19 | 418 | 1,198 | 2,323 | 3,958 | 6.58 | 7.37 (7) |
| 13 | 0 | 138 | 484 | 996 | 1,618 | 2.69 | 3.01 (3) |
| 14 | 263 | 123 | 399 | 811 | 1,596 | 2.65 | 2.97 (3) |
| 15 | 19 | 223 | 83 | 915 | 1,240 | 2.06 | 2.30 (2) |
| 16 | 34 | 684 | 363 | 4,950 | 6,031 | 10.02 | 11.22 (11) |
| 17 | 0 | 130 | 378 | 1,004 | 1,512 | 2.51 | 2.81 (3) |
| 18 | 28 | 238 | 418 | 1,875 | 2,559 | 4.25 | 4.76 (5) |
| 19 | 57 | 231 | 231 | 1,387 | 1,906 | 3.17 | 3.55 (4) |
| 20 | 771 | 1,295 | 49 | 9,533 | 11,648 | 19.36 | 21.68 (22) |
| 21 | 898 | 463 | 542 | 3,943 | 5,846 | 9.71 | 10.87 (11) |
| 22 | 0 | 0 | 176 | 917 | 1,093 | 1.82 | 2.03 (2) |
| | 3,152 | 6,423 | 5,510 | 45,074 | 60,178 | 100.0 | 112 |

has obtained perpetual flowage easements within the South Grand drainage area. This includes the South Grand west of the boundary of Stratum 20, Deepwater Creek, west of the boundary for Stratum 21 principally. Stratum 24, Osage Easement, is those lands within the Ten-Year Floodpool along the Osage River west of the boundary of Stratum 10 and along the Sac River south of the boundary of Stratum 7. With the exception of using 160 acre sample units, the procedures that were to be used to choose the sample units were the same as those outlined for the selection of the fee land sample units. Ideally, this procedure would have worked better for the easement lands than for the fee lands since little, if any, of this area had been previously surveyed and the topography in the western parts of the study area has much less relief than the eastern part. The major factor which complicated the selection of sample units in these strata was the prohibition of subsurface testing in the easement lands. A second factor, though less important, was the need for the permission of the landowner in order to conduct archaeological survey. We were refused permission only in four instances, which resulted in our not being able to inspect approximately 600 acres of land. In three instances, the refusal to grant permission had nothing to do with the archeology, but was a negative reaction to the real-estate acquisition policies of the Corps of Engineers.

As was argued in the original research design (Taylor 1980), this prohibition of subsurface testing meant that, in order for visual inspection to be effective in discovering sites, areas of good surface visibility must be chosen. This, of course, translates as "cultivated fields." A reconnaissance of the easement lands was conducted over a six day period while the fee land survey was in progress. This exercise revealed that cultivated fields were not as abundant as one would wish in order to conduct a truly random sample. In fact, although there was substantially more cultivated land than the 7000 acres necessary for the 16 percent sample, a large fraction of these lands were concentrated in two large parcels (9904 and 10029) in Stratum 24. Both of these parcels were large corporate farms located behind levees. A substantial amount of land modification had been done to modify drainage. As a result of this, it was decided to survey every available parcel and then to make up the difference by surveying these two large parcels. This opportunistic strategy resulted in disproportionate coverage in the two easement strata. Of the 7285 acres surveyed, only 1730 (23.75%) were located in Stratum 23. Of the 5555 acres surveyed in Stratum 24, 2420 acres (43.56%) were concentrated in Parcels 9904 and 10029. In addition, only six sites were found on those parcels (see below). One effect of this is to have created a sample within a sample, with the result that any generalizations made can be seriously skewed if these considerations are not taken into account. For example, 39 sites were found in Stratum 24. If the 5555 acre figure is used uncritically, a density estimate one site per 142 acres can be calculated. If, however, parcels 9904 and 10029 are excluded (and the sites located thereon), then a density estimate of one site per 95 acres is calculated. This problem is merely introduced here, it will be discussed further in a later section of this chapter.

Figures 10 through 14 present the locations of the sample units chosen for both the fee and easement lands. For record keeping purposes, each single unit was numbered as follows. The first number refers to the stratum in which the sample unit is located, and the second number refers to an individual sample unit (e.g., 9-1).

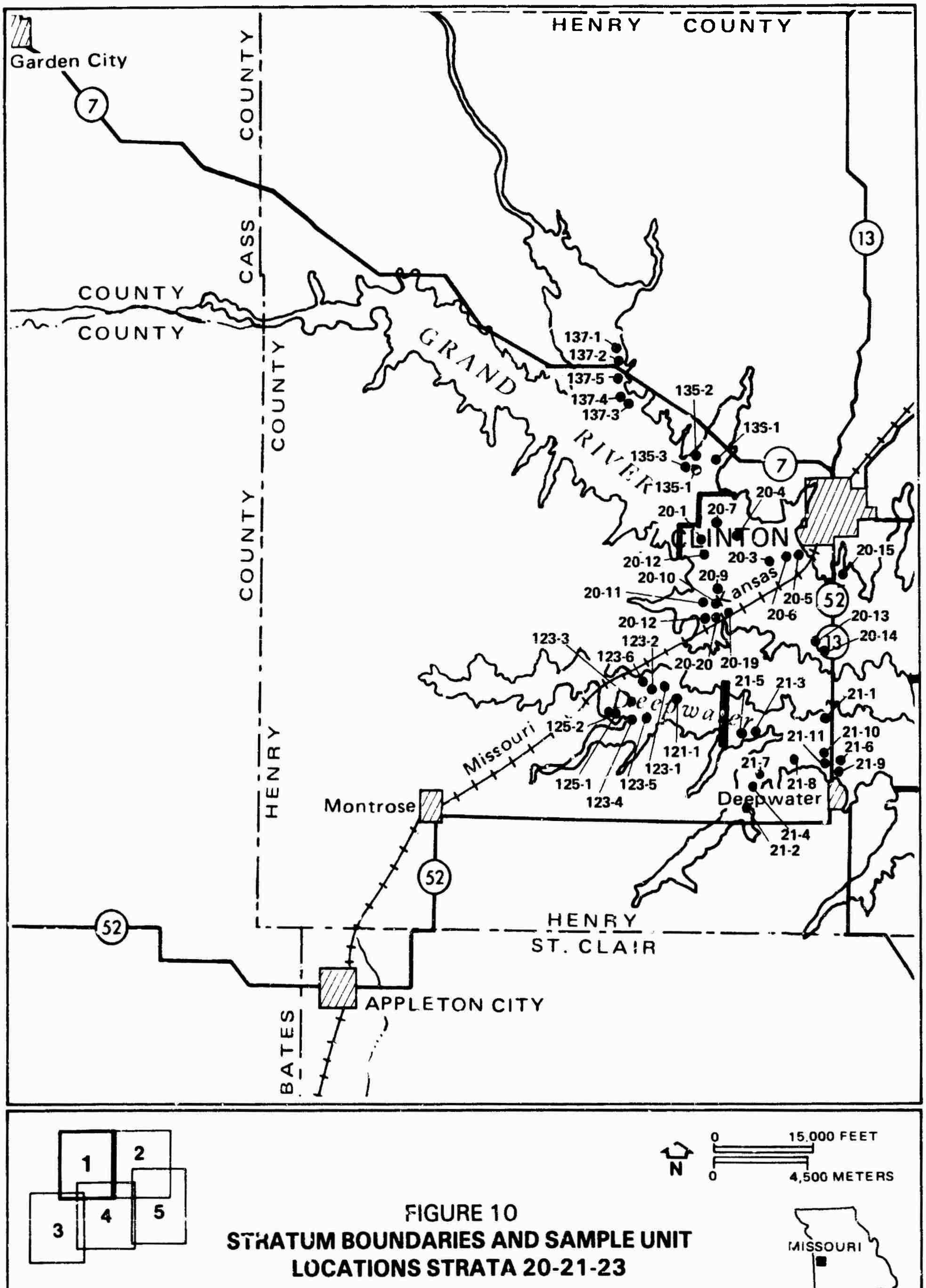


FIGURE 10
**STRATUM BOUNDARIES AND SAMPLE UNIT LOCATIONS STRATA 20-21-23**

HARRY S. TRUMAN RESERVOIR — OSAGE RIVER BASIN
U.S. ARMY ENGINEER DISTRICT — KANSAS CITY, MISSOURI

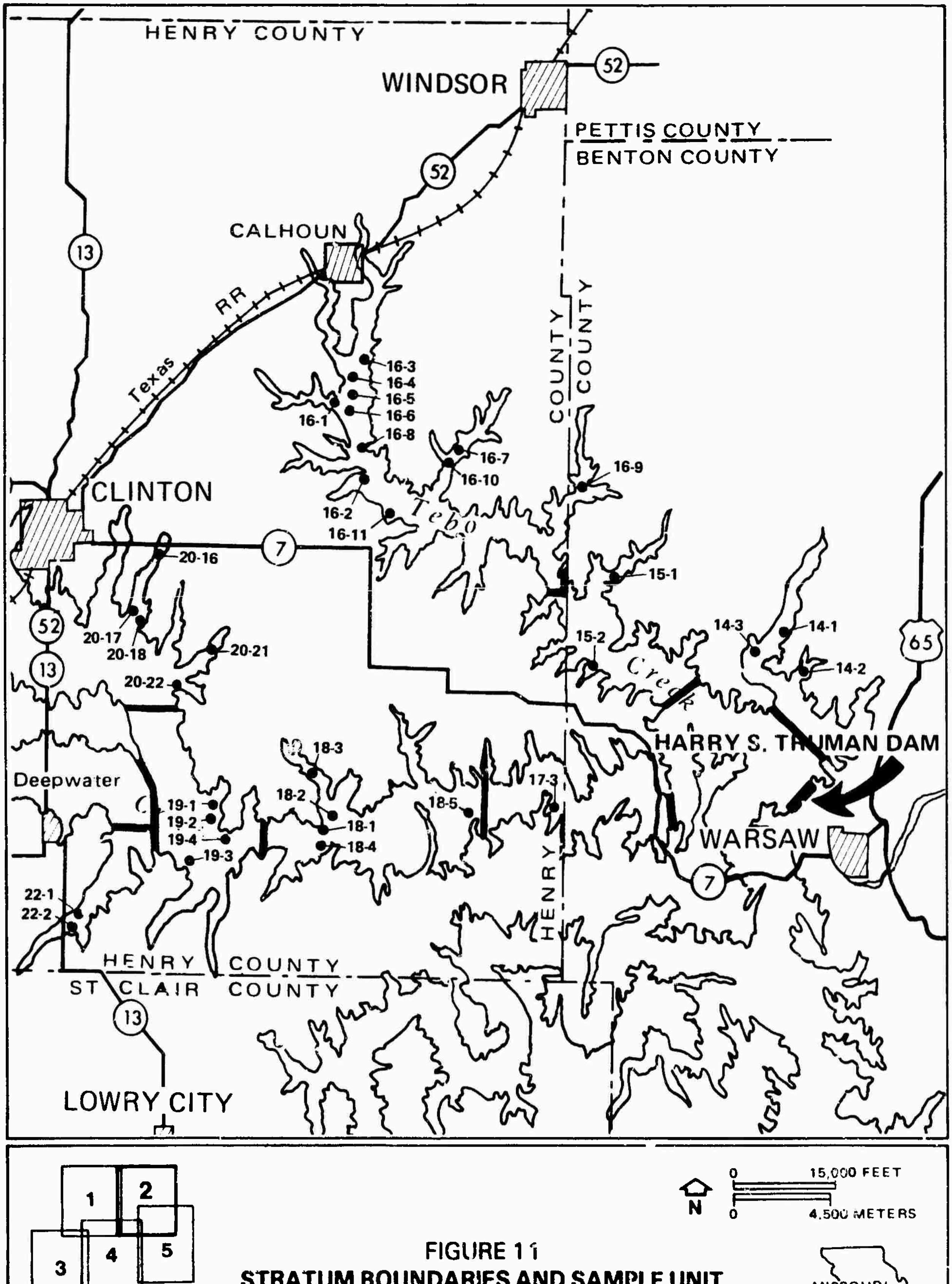


FIGURE 11
**STRATUM BOUNDARIES AND SAMPLE UNIT LOCATIONS STRATA 14-15-16-17-18-19-20-22**

HARRY S. TRUMAN RESERVOIR — OSAGE RIVER BASIN
U.S. ARMY ENGINEER DISTRICT — KANSAS CITY, MISSOURI

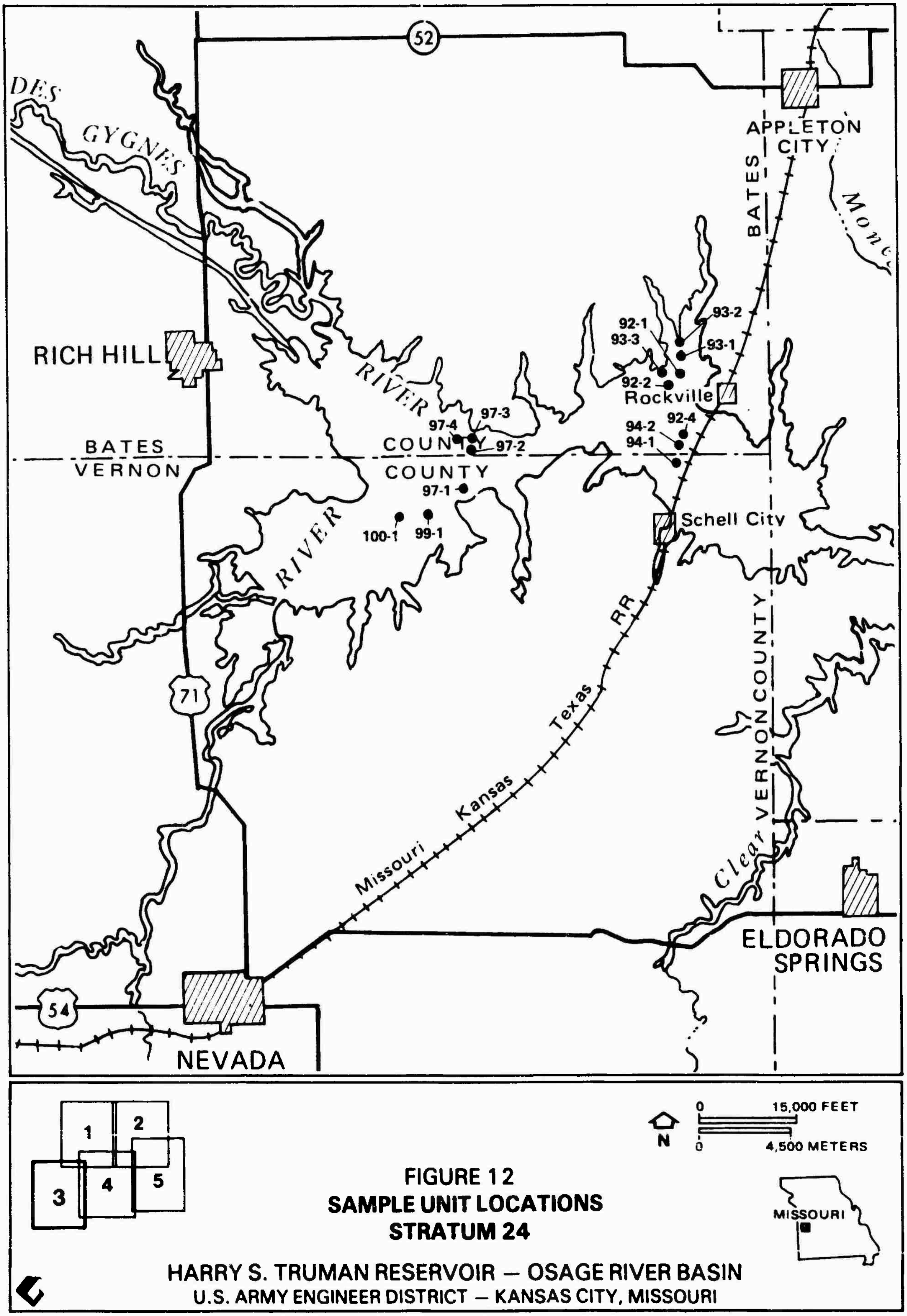


FIGURE 12
**SAMPLE UNIT LOCATIONS**
**STRATUM 24**

HARRY S. TRUMAN RESERVOIR — OSAGE RIVER BASIN
U.S. ARMY ENGINEER DISTRICT — KANSAS CITY, MISSOURI

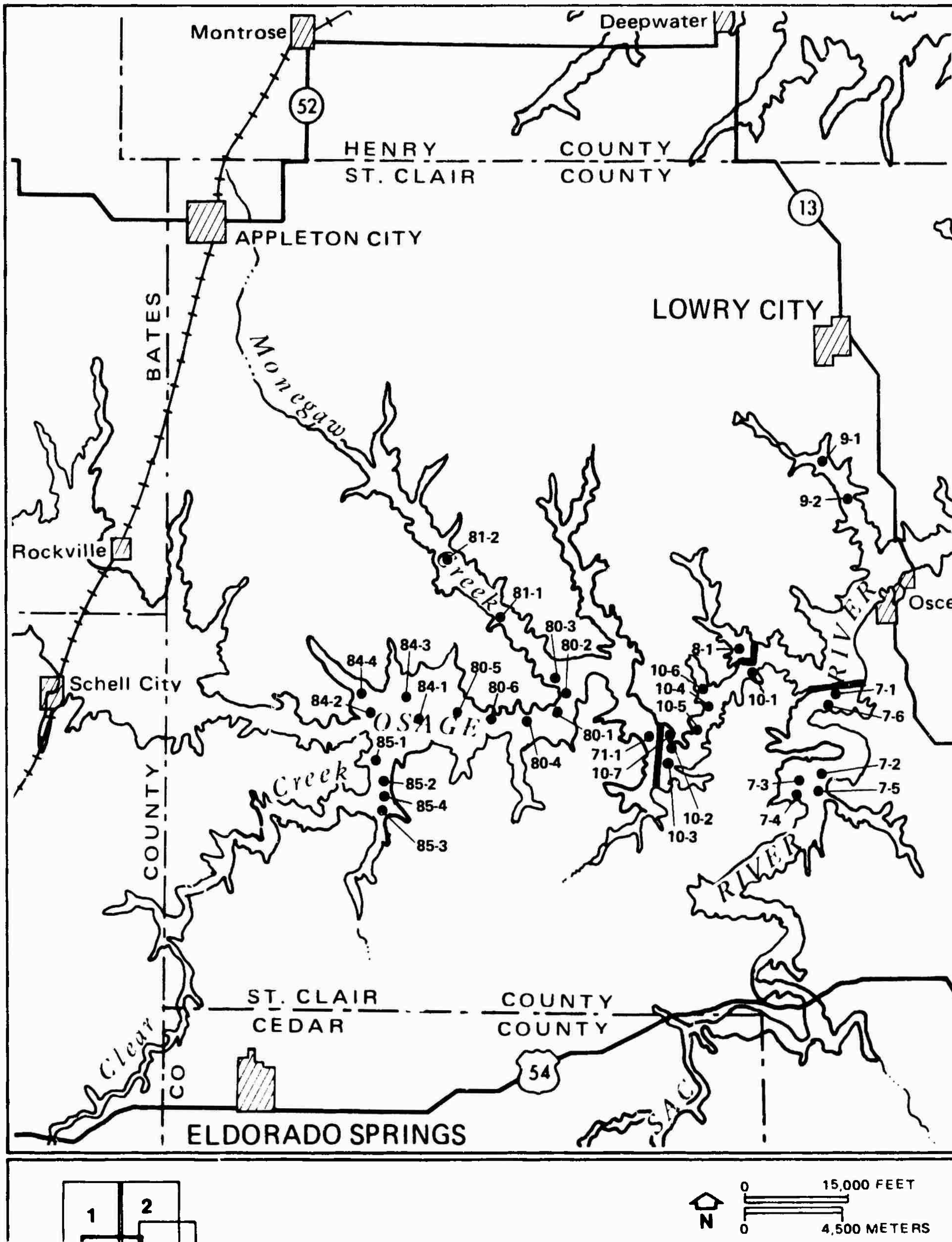


FIGURE 13
**STRATUM BOUNDARIES AND SAMPLE UNIT LOCATIONS STRATA 7-8-9-10-24**

HARRY S. TRUMAN RESERVOIR — OSAGE RIVER BASIN
U.S. ARMY ENGINEER DISTRICT — KANSAS CITY, MISSOURI

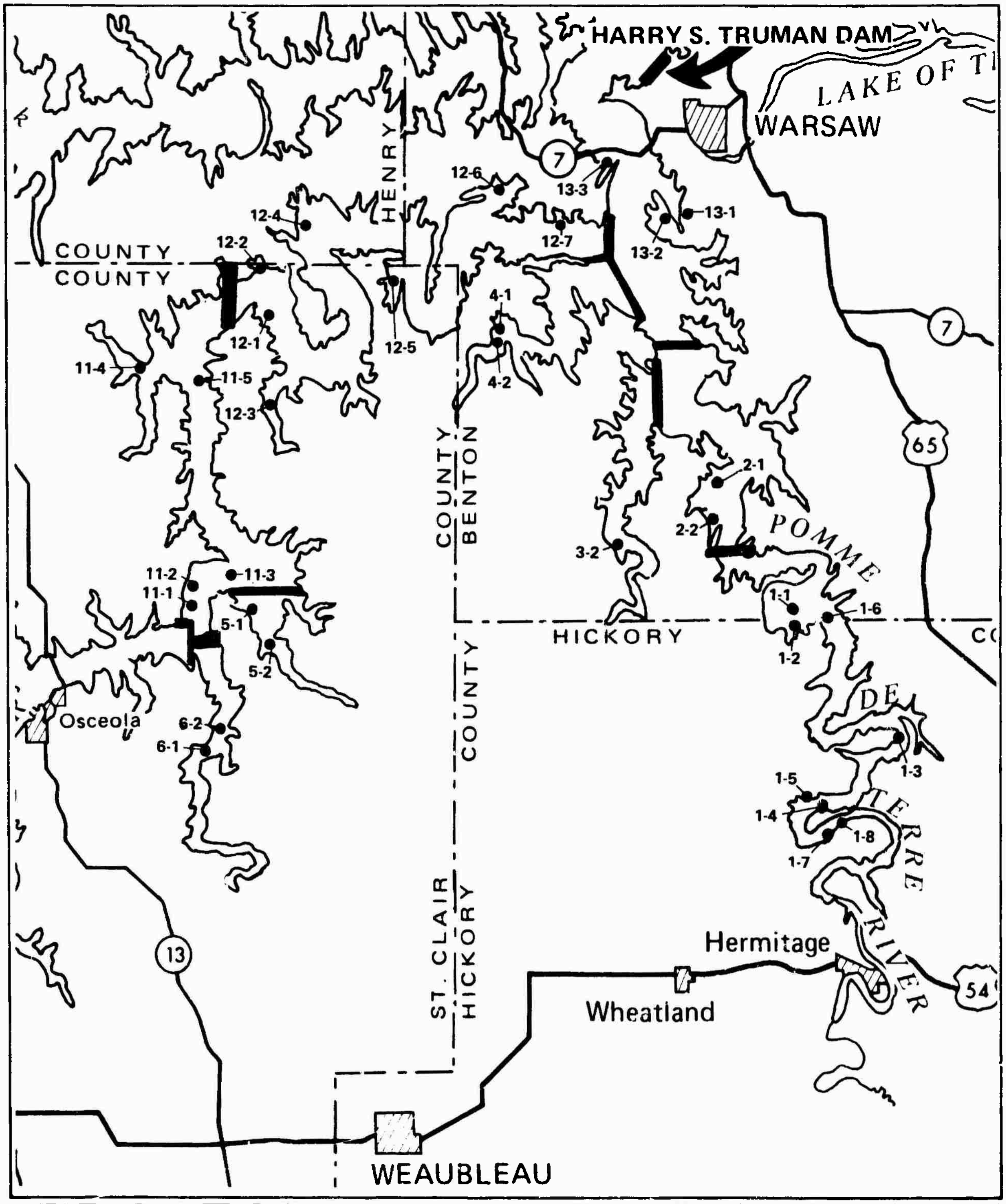


FIGURE 14
**STRATUM BOUNDARIES AND SAMPLE UNIT LOCATIONS STRATA 1-2-3-4-5-6-11-12-13**

HARRY S. TRUMAN RESERVOIR — OSAGE RIVER BASIN
U.S. ARMY ENGINEER DISTRICT — KANSAS CITY, MISSOURI

During the actual survey of a sample unit, a sample unit form was completed. The information recorded has two major emphases. One emphasis is the information related to the analysis of settlement pattern. Observations were made on the percentage of various land forms, slope, amount of elevation, and the rank of the nearest water. The second emphasis is information about survey condiions and factors that might affect the location and identification of sites. Observations were made about the kind of land surveyed (i.e., cultivated, forest, etc.), the amount of groundcover, number of surveyors, time spent surveying the size of sample unit. This information is tabulated for each sample unit and is presented in Appendix D, Tables D-2 and D-3.

This information is again summarized by stratum for each type of information, and these results are presented in Appendix D, Tables D-4, D-5. Averages show that the survey of the Ten-Year Floodpool was concentrated primarily on the T-1 landform, which can be expected to have the highest site density. Although these landforms are close to water, they probably are subject to only infrequent flooding. In this category was 53.02 percent of the land surveyed. The second most frequently surveyed landform was the slope category, with 28.91 percent of the total surveyed. T-0, or active floodplain comprised 10.14 percent of the sample, and T-2 comprised 6.6 percent of the sample. The "other" category was barely used and will not be considered further. The average slope of a sample unit was 4.17 percent with the range (for strata) being from 27.5 percent in Stratum 15 to 0.5 percent in Stratum 22. Most of the average slopes fell in the 1 percent to 3 percent range. The absolute elevation of each sample unit by stratum averaged 23.03 feet with a range of 12.55 in Stratum 23 to 25 in many of strata. The rank of the nearest water ranged from 3.59 in Stratum 20 to 10 in Stratum 10. Interestingly, a look at these data in relation to the average number of sites per sample unit shows little relationship between any one attribute of a sample unit and the number of sites thereon. High and low values for each attribute have both high and low numbers of sites per sample unit.

It can be seen in Table D-5 that, of the various kinds of lands surveyed, the most frequently surveyed were cultivated fields, comprising 28.22 percent of the total. It should be kept in mind that this total is slightly inflated in regard to the fee lands because survey was limited to only cultivated fields in Strata 23 and 24. Pasture comprised 26.48 percent of the land surveyed. The next most frequently surveyed category was old field, representing 21.69 percent of the total. Very close to this figure was mature forest which accounted for 20.91 percent of the land surveyed. Wasteland was an insignificant component of the land types examined. The average for groundcover is 61.77 percent visibility. As was the case with Table 12, an inspection of Table D-5 reveals little patterning between various attributes of the sample unit and site locations. High and low values for surface visibility have low and high values for number of sites per sample unit.

There have been three previous surveys of lands within the Ten-Year Floodpool, the Stage I and Stage II survey reported by Roper (1977) and the survey of the public use areas (Roper 1981d). The Public-Use Area survey report has not been available, and this discussion will concentrate on the Stage I and Stage II surveys. As was mentioned above, the acreage within Strata 1 through 22 was measured and the amount of coverage was determined for each previous survey (see Table 7) in this section. The results of the Stage II survey and of the present

survey will be used to develop estimates of the total number of sites present within the Ten-Year Floodpool. It should be noted that the measurement of acreage may be in error, especially in the discussion of the Stage II survey.

Table D-6 (Appendix D) displays the results of both the Stage I and Stage II surveys including those sites found within the Ten-Year Floodpool. As can be seen, the number of sites found within the Ten-Year Floodpool comprises a significant fraction of the total found. This is especially true for Strata 20 and 21. This is also predictable because most of these strata are located within the Ten-Year Floodpool. For example in Stratum 20, the total acreage as measured by Roper(1977:75) is 16,580.41 acres, of this 11,684 acres are within the Ten-Year Floodpool, or 70.25 percent. This is mentioned to illustrate the differences in estimates between the Stage II survey and the present one. This is partly due to the opportunistic choices of areas to be surveyed during the Stage I survey. The Stage I project stressed survey of cultivated fields with high surface visibility (Roper, personal communication). Therefore, the Stage I survey may have disproportionately surveyed areas within the Ten-Year Floodpool with the greatest probability of having sites. This may be a principal reason for the drastic differences that obtain in some of the estimates below.

As can be seen in Table D-6, 442 sites were located within the Ten-Year Floodpool during the Stage I and Stage II surveys. For Stage II, the sites in the Ten-Year Floodpool comprised 27.83 percent of the total found although, of the total acreage surveyed, lands in the Ten-Year Floodpool comprised 39.65 percent. In examining the results of the Stage II survey, there does not appear to be any relationship between the location of a stratum within the project area and the proportion of sites that were found within the Ten-Year Floodpool. This suggests that these totals are due to fortuitous placement of the sample transects and not to real differences in the distribution of sites. For example, consider the results of Stage I and Stage II for Stratum 1 and Stratum 21. In Stratum 1, the Stage I survey located 68 sites, 11 of which are within the Ten-Year Floodpool. During Stage II, when 55 sites were recorded, 17 of them were in the Ten-Year Floodpool, even though over half of the area surveyed was within the Ten-Year Floodpool. Similarly, for Stratum 20, the Stage I survey located 108 sites, 71 of which were in the Ten-Year Floodpool. During Stage II, 8 sites were recorded, and only one of these was within the Ten-Year Floodpool even though 70.53 percent of the acreage surveyed was within the Ten-Year Floodpool. Survey conditions in heavily vegetated areas are such that radically different estimates can be obtained even by the same investigator. For this reason, it is often better to employ multiple surveys, each with different personnel and survey strategies, and then compare and contrast the result. This can provide an immediate check on the accuracy or the reliability of different estimates.

The estimated populations for each stratum and the Ten-Year Floodpool are given in the right-hand column of Table D-6. They range from a low of zero (no acreage surveyed) to 9.46 for Stratum 12 to 149.93 for Stratum 16. Based on these estimates, a total population of 1353 sites is projected.

The results of the present survey of the Ten-Year Floodpool is presented in Table D-7 (Appendix D). This table displays the total acreage for each stratum for the Ten-Year Floodpool, the number of sample units, the sample fraction, number

of sites found, site density per square mile and the estimated population for each stratum. These estimates range from a low of 6.31 sites for Stratum 17 to 130.23 sites for Stratum 16. Inspection of this table and Table D-6 indicates that there are a number of estimates which are in close agreement. There are, however, a larger number that are substantially different. As was mentioned above, these differences may be due to disproportionate cover of the different strata during the Stage I and Stage II surveys. As can be seen, a population estimate of 905 sites is offered. This does differ substantially from the previous estimate. Perhaps it would be best to consider these two estimates as brackets around the true population total for the Ten-Year Floodpool.

## SITE DESCRIPTIONS

The survey of the Ten-Year Floodpool involved the inspection of 162 parcels of land on which 180 prehistoric sites were located and evaluated. In this chapter, we will present a description of each site and a number of tables which will serve to summarize various aspects of the information recorded for each site.

As was noted in the research design, one major concern is the differential use of forest and prairie zones by prehistoric inhabitants of the study area. Therefore, the 24 survey strata that have been described above will be aggregated into eight units. This will be accomplished as follows:

| | | |
|---|---|---|
| Aggregate 1 | = | Strata 1, 2, 3 |
| Aggregate 2 | = | Stratum 4 |
| Aggregate 3 | = | Strata 5, 6, 7, 8, 9, 10 |
| Aggregate 4 | = | Strata 11, 12, 13 |
| Aggregate 5 | = | Strata 14, 15, 16 |
| Aggregate 6 | = | Strata 17, 18, 19, 20, 21, 22 |
| Aggregate 7 | = | Stratum 23 |
| Aggregate 8 | = | Stratum 24 |

These aggregates are larger geographical groupings of contiguous strata. This has been done to facilitate comparison amongst a limited number of observations against a potentially large number of reference points. As will be seen below in the lithic analysis, the strategy materially enhances the discussion of the results. Table D-8, Appendix D lists the sites found during the survey by stratum and sample unit. The site descriptions which follow are organized alphabetically by county -Bates, Benton, Henry, Hickory, St. Clair and Vernon - and in numerical order within each county. This will facilitate locating a specific site description.

### Bates County (BT)

### 23BT56 - Early Archaic, Late Archaic, Woodland

This site is a lithic scatter found on the first terrace of Panther Creek, 100m west of the creek. Intensive inspection of the site revealed two major concentrations. The first concentration consisted of the southern portion of the site. It was decided that this area would be broken into three loci; a general surface collection would be made for each loci. The second concentration had a higher artifact density, and was best sampled linearly. One transect was laid out north to south,

containing three randomly placed collection units. Several individual artifacts were assigned proveniences. Flakes, cores, chunks, hafted bifaces bifaces and unifaces were collected from ten proveniences. Site size was estimated to be 200m by 50m.

Eight hafted bifaces were collected and categorized, after Goldberg and Roper (1981) as follows: one was an unidentifiable corner-notched (364); one Category 384 (Hardaway); one Category 307 (Afton); one Late Archaic to Woodland diagnostic and two items for Category 306, diagnostic of the Late Archaic and Woodland periods. The remaining three were not representative of any of Goldberg's and Roper's (1981) categories. They were each classified as a Category 404 side-notched point, Category 400 corner-notched point or Category 406 potentially diagnostic biface.

**23BT57 - Unidentified Prehistoric**

This site is a lithic scatter found on the first terrace of an unnamed intermittent stream that runs into Panther Creek. The site is located 60m to the west of the stream, and was discovered in agricultural land during a walkover survey. Since only two flakes were found, a total collection was employed and one provenience was assigned. Site size was estimated to be 15m by 1m.

**23BT58 - Unidentified Prehistoric**

This site is a lithic scatter found on the first terrace above the confluence of two intermittent streams, 50m east of the confluence. First encountered during a walkover of agricultural land, the site was extensively inspected. It was decided that since this site was a sparse and small scatter that a total surface collection strategy was warranted. Flakes, chunks and bifaces were recovered. Site size was estimated to be 80m by 50m. One corner-notched biface fragment was found here, but not enough of the specimen remained to permit classification within the Goldberg and Roper (1981) typology.

**23BT59 - Unidentified Prehistoric**

This site is a lithic scatter found on the first terrace above an old meander channel of the Osage River. Pecan Slough is 200m to the east of this site. Found during a walkover of agricultural land, this site is a small, sparse lithic scatter. It was decided to do a total surface collection of this site. Flakes, chunks and a core were recovered. Site size was estimated to be 30m by 20m.

**23BT60 - Late Archaic-Woodland**

This site is a lithic scatter found on the first terrace of an old meander channel of the Osage River, Pecan Slough. The slough is 100m to the east of the site. Site collection was conducted after a thorough inspection of the agricultural lands in the vicinity. A general surface collection was employed, with all artifacts being assigned one provenience. Flakes, cores, chunks, bifaces, a hafted biface and a uniface were recovered. Site size was estimated to be 40m by 30m.

A single hafted biface was recovered from this site. After being classified, using the typology reported by Goldberg and Roper (1981), this specimen was

labeled as a Category 342 (Table Rock Stemmed). This type of point has been dated to the Late Archaic and possibly to the Woodland Periods.

**23BT61 - Unidentified Prehistoric**

This site is a lithic scatter found on the edge of the first terrace of Little Clear Creek. The site is situated to the west of an intermittent stream and 200m to the west of Little Clear Creek. The site, after being intensively surveyed, was divided into four quadrants with a total surface collection employed. Flakes, a hafted biface and bifaces were recovered on this site. The hafted biface was too damaged to be classified. Site size was estimated to be 75m by 50m.

**Benton County (BE)**

**23BE1018 - Unidentified Prehistoric**

This site is a lithic scatter found on the floodplain of an unnamed intermittent stream. The site is adjacent to the stream, which lies to the north. Discovered while conducting shovel testing, the site was found to be eroding out of a pasture. Ten shovel tests were placed above the area where the flakes were encountered. No new cultural materials were found. Site size was estimated to be 15m by 1m.

**23BE1019 - Unidentified Prehistoric**

This site is a lithic scatter found on a slope above the Pomme de Terre River. Although the site is now situated on the shoreline of the reservoir, originally the river was 200m to the west. The site was found during shovel testing of former home sites that had been bulldozed. Cultural materials were exposed in old bulldozer cuts and other open areas. Ten shovel tests were excavated in those areas with more limited visibility. Flakes and a biface were recovered. Numerous historic artifacts were present due to the presence of home sites. Site size was estimated to be 60m by 40m. A single fragment of a hafted biface was collected, but was too damaged to permit a proper evaluation. It was placed in Category 999 after Goldberg and Roper (1981).

**23BE1020 - Late Archaic, Middle, Late Woodland**

This site is a lithic scatter found on the floodplain of the Little Pomme de Terre River, 40m to the southwest. A walkover survey was being conducted on plowed fields when the site was discovered. After an intensive survey to delineate site boundaries and identify artifact locations, it was decided that a transect survey be conducted to sample the site. Two transects were placed along the northeast to southwest axes, having a total of seven collection units. Seventeen additional artifacts were also plotted on the site map and assigned proveniences. Flakes, cores, chunks, bifaces, unifaces and hafted bifaces were recovered.

Site size was estimated to the 165m by 40m. The three hafted bifaces found on this site were classified after Goldberg and Roper (1981). One was found to be diagnostic of the Middle and Late Woodland periods, Category 325, and the other was a Category 339 (Etley), which is attributed to the Late Archaic period. The

third specimen did not fit into any of Goldberg's and Roper's (1981) categories. It was designated Category 400, a potentially diagnostic corner-notched point.

**23BE1021 - Unidentified Prehistoric**

This site is a lithic scatter found on a levee on the flooplain of the Little Pomme de Terre River, 20m west of the river. After initial discovery of the site during a walkover survey of plowed agricultural land, an intensive survey was conducted to delineate site boundaries and locate tools and concentrations. It was decided to use the linear strategy to collect this site. One transect was placed along the levee, with three collection areas randomly selected along it. Flakes, cores, chunks and a hafted biface were found. Site size was estimated to be 60m by 30m.

Only one hafted biface was found on this site, it, however, was not representative of any of Goldberg's and Roper's (1981) typology. This specimen was assigned to Category 400, potentially diagnostic corner-notched points.

**23BE1022 - Late Archaic**

This site is a lithic scatter found on the floodplain 200m to the southwest of the Little Pomme de Terre River. After the site was discovered during a walkover of cultivated fields, an intensive inspection was conducted to determine the site's size and artifact distribution. It was decided to sample this site with the transect strategy. Five transects were randomly chosen, each with six collection units. Flakes, cores, and chunks were recovered in the thirty collection units. Site size is estimated to be 300m by 125m. One hafted biface was recovered from this site, and was classified as an Etley point (Category 339). This suggests a Late Archaic occupation of the site. (Goldberg and Roper 1981:42).

**23BE1023 - Unidentified Prehistoric**

This site is located on the first terrace of Hogles Creek, which is about 30m to the southeast of the site. The site was discovered during shovel testing of sample Unit 4-1. When artifacts were found in a shovel test, 12 additional shovel tests were placed in a surrounding area approximately 30m by 50m in size. Only one of these yielded additional artifacts. Flakes were the only artifact type recovered. Site size is estimated to be 15m by 15m.

**23BE1024 - Unidentified Prehistoric**

This site is a lithic scatter found on the first terrace 60m to the west of Hogles Creek which is 60m to the west. The site was discovered during shovel testing in pasturelands. Shovel tests were spaced over the terrace in regular 10m intervals in order to define the boundary of the site. Six shovel tests were found to contain artifacts, which included flakes, cores and chunks. Heavy ground cover restricted surface collections. As a result only one artifact was collected from surface inspection. Site size is estimated to be 150m by 65m.

**23BE1025 - Unidentified Prehistoric**

This site is a lithic scatter discovered during standard shovel testing procedure in pasturelands. The site is situated on the first terrace 35 meters to the west of Hogles Creek. Shovel testing at 10m intervals was conducted to determine site size. Only two of the shovel tests yielded cultural materials. A limited surface inspection, due to the high density of ground vegetation, yielded one artifact. Flakes were the only artifacts found. Site size was estimated to be 20m by 20m.

**23EB1026 - Unidentified Prehistoric**

This site is a lithic scatter discovered during shovel testing of a fescue field. The site is situated on the first terrace 150m west of Hogles Creek. In order to establish site boundaries, shovel tests were dug in 10m intervals out from the shovel test in which the initial find was made. Only two shovel tests yielded flakes. It was not possible to carry out a surface collection due to dense groundcover. Site size was estimated to be 10m by 30m. No diagnostic artifacts were collected from this site.

**23BE1027 - Late Archaic, Late Woodland**

This site is a lithic scatter and rockshelter found on a slope and first stream terrace adjacent to Hogles Creek, which borders the site on the east and south. The site is primarily in a fescue field, but some plowed field is also present. The site was discovered during shovel testing procedures. After the discovery of cultural materials, shovel tests were more closely spaced in order to delineate site boundaries. A total of 70 shovel tests were placed on the first terrace, 45 of which were found to contain cultural materials. The southeastern quarter of the site was a plowed field, which was found to be a continuation of the site already identified from shovel testing. An intensive inspection of the plowed area was conducted to determine site boundaries and presence of lithic tools. It was found that, while most of the plowed area was a light scatter, there were three main concentrations which served as the basis for collecting this portion of the site. Two concentrations, designated as Locus 1 and Locus 2, were sampled using circular strategies with four collection units each. On the remaining concentration, designated Locus 3, a transect strategy was employed. One transect was laid out with one collection unit randomly place on it. A final locus, Locus 4, was designated for a rockshelter found on a slope on the western edge of the site. A surface collection of the shelter floor was made, along with the placement of two shovel tests in front of the shelter. Flakes, cores, chunks, hafted bifaces, bifaces, unifaces, shell and bone were collected on this site. Site size is estimated to be 350m by 450m.

A total of seven hafted bifaces were collected from the site, and classified after Goldberg and Roper (1981). Three of these were too damaged to be diagnostic and were assigned to Category 999 and Category 362. The remaining specimens were representative of Categories 355 and 339 (Etley), both Late Archaic, and Category 334 (Fresno), a Late Woodland or Protohistoric point (Goldberg and Roper 1981).

**23BE1028 - Unidentified Prehistoric**

This site is a lithic scatter found while conducting shovel testing of an old farm road. The site is located on the edge of a slope overlooking a small intermittent stream, which is approximately 30m to the northwest. The site was discovered while inspecting open areas within the otherwise heavily vegetated survey unit. All artifactual materials, which consisted of flakes only, were assigned to one surface provenience. Additional shovel tests dug in the pasture around aritfact concentrations on the road yielded no additional materials. Site size was estimated to be 10m x 2m.

**23BE1029 - Unidentified Prehistoric**

This site is a lithic scatter discovered while shovel testing pastureland. The site is on a slope adjacent to a small intermittent stream, which lies to the east. This site is also close to the shoreline of the reservoir, which is to the north of the site. The initial shovel test yielded flakes. Eight shovel tests were subsequently placed around it. Several additional shovel tests were found to contain flakes. The presence of a dense grass cover precluded any attempts to conduct surface collection. Site size was estimated to be 20m x 15m.

**23BE1030 - Unidentified Prehistoric**

This site is a lithic scatter discovered on a slope below the crest of hill. The site is in a mature forest overlooking an intermittent stream, which is 30m to the southeast. Much of this stream has been inundated by the reservoir, so that the site is almost on the shoreline. The site was found by examination of open areas during shovel testing. One general surface provenience was made, along with an additional four shovel tests. The shovel tests were ineffective due to the thin and rocky soil. Site size was estimated to be 25m x 5m.

**23BE1031 - Unidentified Prehistoric**

This site is a lithic scatter located on a steep downslope which is abutted by the Tebo Creek arm of the reservoir. It is also 30m to the southeast of a small intermittent stream. The site was discovered while inspecting areas of high visibility during shovel testing within a wooded area. All material, a flake and chunks, were collected in one surface provenience. No artifacts were found in shovel tests. The soil here was thin and rocky.

**23BE1032 - Unidentified Prehistoric**

The site is a lithic scatter located on an equipment trial in a pasture about 60m northeast of the confluence of two intermittent streams. All visible surface materials were collected and four shovel tests were employed to delineate the site boundaries. These shovel tests yielded no additional material. Site size was designated as being 3m x 3m.

### 23BE1033 - Unidentified Prehistoric

This site is a lithic scatter discovered during the shovel testing of a pasture. The site is situated 10m north of an intermittent stream on the second terrace. Artifacts were visible in patches of bare ground, and all of these were collected. Additional shovel testing yielded no additional material. Two flakes comprise this site's artifact collection. Site size was estimated to be 8m x 20m.

### 23BE1034 - Unidentified Prehistoric

This site is a lithic scatter found during the inspection of an abandoned agricultural field. The site is situated on the floodplain of the Little Tebo Creek which is directly to the southeast. Portions of the site have been inundated by the reservoir. Due to a high amount of surface visibility a walkover survey was employed. It was decided to use a circular collection combined with the piece-plotting of individual tools not in collection units to recover artifacts. Four units were collected. Two artifacts were pieceplotted. Flakes, chunks, and bifaces were recovered. Site size was determined to be 26m x 20m.

### 23BE1035 - Unidentified Prehistoric

This site is a lithic scatter discovered during an inspection of an abandoned agricultural field. The site is located on the floodplain of Little Tebo Creek which is located 300m to the southeast. Good surface visibility allowed for a surface collection of this area. After determination of the site's boundaries, it was determined that a linear collection strategy be employed. One transect was oriented through the area of highest artifact density, with two randomly chosen collection units placed along each transect. Flakes were the only artifact type present. Site size was determined to be 120m by 120m.

### 23BE1036 - Unidentified Prehistoric

This site is a lithic scatter discovered in a cultivated field. The site is located on the floodplain of Little Tebo Creek which was approximately 700m to the east. A smaller intermittent stream is also found adjacent to the site on the eastern side. This portion of the site is close to the shoreline of the reservoir. A linear strategy was employed along with piece plotting of tools outside of collection units. Flakes, chunks, bifaces, and unifaces were recovered in 12 surface collection proveniences. Site size was estimated to be 60m x 15m. The denser portion of the site was located on the eastern edge of the site.

### 23BE1037 - Unidentified Prehistoric

This site is a lithic scatter in an abandoned agricultural field situated on the shoreline of the reservoir, with an intermittent stream being located 60m to the northeast. Since there was a high percentage of visible ground, a surface collection was conducted. It was determined that one linear transect be employed oriented with a portion of the site with the highest artifact concentration. Flakes were recovered in two collection units situated on the transect. Site size was estimated to be 65m x 27m.

**23BE1038 - Unidentified Prehistoric**

This site is a lithic scatter discovered in a plowed field on a slope above Little Tebo Creek, with an intermittent stream 35m to the north. After inspection of the site it was decided that the linear strategy would be used to collect the site. The two collection units contained flakes only. Site size was estimated to be 75m by 25m.

**23BE1039 - Unidentified Prehistoric**

This site is a lithic scatter discovered while shovel testing in pastureland. The site is located on the floodplain of Clear Creek, which is 50m to the south of the site. After the discovery of a flake in one of the shovel tests, a more intensive coverage of the immediate area was initiated. These subsequent shovel tests did not uncover any more cultural materials. A surface collection was not conducted due to the density of the ground vegetation. Site size was estimated to be 15m by 15m.

**23BE1040 - Unidentified Prehistoric**

This site is a lithic scatter discovered while shovel testing in pasturelands and woods. The site is located on the second terrace above Clear Creek which is located 100m to the south. The site was discovered while performing standard shovel testing procedures. After cultural materials were initially recovered, a more intensive distribution of shovel tests was dug to 50 cm. Visual inspection of open areas around an old farm road also yielded artifacts. Of six shovel tests dug, two contained artifacts. Flakes were the only class of artifacts to be recovered. Site size was estimated to be 25m by 25m.

**23BE1041 - Unidentified Prehistoric**

This site is a lithic scatter discovered while conducting shovel testing in pastureland. The site is located on a slight rise, which is about 1m-1.5m high, on the first terrace of Clear Creek, which is 40m to the north of the site. Collection of the site was facilitated by digging several shovel tests around and on the rise. Three shovel tests placed on the little knoll yielded flakes. All other shovel tests were empty at 50 cm. Surface collection was not conducted due to heavy groundcover.

**23BE1042 - Unidentified Prehistoric**

This site is a lithic scatter discovered while shovel testing in pasturelands. The site is located on the first terrace above Clear Creek, which is 110m to the south. Several shovel tests were dug to a depth of 50 cm in order to delineate site boundaries. Flakes were recovered from shovel tests on the site. Limited ground visibility made surface collection impractical. Site size has been estimated to be 150m x 60m. No cultural affiliations have been assigned.

Two projectile points were collected from this site and classified after Goldberg and Roper, (1981). Both specimens were placed in Category 364 for corner-notched points which are too damaged to be further categorized.

**23BE1043 - Unidentified Prehistoric**

This site is a lithic scatter located at the end of a ridge nose that terminates above the floodplain of Tebo Creek, which is now inundated. Discovery of the site was made through shovel testing. A total of nine shovel tests were spaced at regular intervals to determine site size. Those areas with better ground visibility were also covered. Flakes and a uniface were found the shovel tests, while one biface was recovered during the surface inspection. Site size is estimated to be 50m x 30m.

**23BE1044 - Unidentified Prehistoric**

This site is located on the edge of a ridgenose above the first terrace of Brush Creek. The site is situated close to the confluence of Brush Creek and an unnamed intermittent tributary. Brush Creek lies approximately 200m to the west, while the intermittent is located 85 meters south. The site was first encountered during a standard shovel test survey. More shovel tests were placed every 10m from the initial find, in order to estimate site size. A total of twelve shovel tests yielded flakes and chunks. Site size was estimated to be 30m by 80m.

**23BE1045 - Unidentified Prehistoric**

This site is a lithic scatter located on a ridgenose above the confluence of Big Branch and the Pomme de Terre River. This site was first identified during shovel testing conducted in pasturelands and forests. Fifteen shovel tests were placed in a regular pattern, to a depth of 50cm, around the initial find. A surface collection was also conducted in and around an old farm road. Flakes, cores, bifaces and hafted bifaces were recovered in nine shovel tests and the one surface provenience. Site size was estimated to be 125m by 125m.

This site had a total of three hafted bifaces collected from it. One specimen was damaged and the remaining two were not representative of any of the categories in Goldberg's and Roper's (1981) typology. These items were assigned to Category 400, potentially diagnostic corner-notched points, and Category 403, potentially diagnostic stemmed points.

**23BE1046 - Unidentified Prehistoric**

This site is a lithic scatter found during shovel testing of a forested area. The site is situated on a ridgeslope above an intermittent stream, which is 20m to the west of the site. Ten shovel tests were dug to a depth of 50cm in addition to the shovel test initially locating the site. Six of these shovel tests yielded cultural materials. A surface collection was also conducted in an abandoned farm road. Flakes and chunks were recovered. Site size was estimated to be 45m by 45m.

**23BE1047 - Unidentified Prehistoric**

This site is a lithic scatter found during shovel testing conducted in pasturelands. The site is situated on a slope 100m to the south of Big Branch. A total of five shovel tests were dug to a depth of 50cm. Of these, three were found to have cultural materials present. No surface collection was conducted due to the

density of ground cover. Site size was estimated to be 65m by 40m. No cultural affiliations can be assigned.

**23BE1048 - Unidentified Prehistoric**

This site is a lithic scatter found while shovel testing in pasturelands. The site is situated 50m to the east of Big Branch on a slope. After the initial discovery of the site, further shovel testing was conducted in regular intervals from the initial find. Several of these yielded cultural materials. Flakes were the only artifacts found at this site. No surface collection was conducted due to a lack of surface visibility. Site size is estimated to be 110m by 55m.

**23BE1049 - Unidentified Prehistoric**

This site is a lithic scatter discovered while shovel testing in pastureland and is situated 100 meters to the south of the Pomme de Terre River on a ridgeslope. Several shovel tests were dug to a depth of 50cm, to determine site size and artifact densities. Flakes and a hafted biface were found at this site. No surface collection could be conducted because of the density of the vegetation. Site size is estimated to be 45m by 25m. One hafted biface was recovered but proved to be too damaged to be assigned to any culturally diagnostic categories.

**23BE1050 - Unidentified Prehistoric**

This site is a lithic scatter found during shovel testing of forested areas. The site is located 75m to the south of an unnamed intermittent creek. Several shovel tests were dug to delineate site size. The depth of the soil was variable, in some places as much as 20cm, in other places, there was practically no soil. Flakes were the only cultural materials recovered. No surface collection was possible due to heavy ground vegetation. Site size is estimated to be 25m by 25m.

**23BE1051 - Unidentified Prehistoric**

This site is a lithic scatter discovered during shovel testing of a pasture. The site is situated on the second terrace of the Osage River, and is now approximately 40m north of the reservoir shoreline. Several flakes were found in one shovel test, and while more shovel tests were dug around the initial find, no additional materials were recovered. A surface collection was not possible due to the density of the ground cover. Site size was determined to be 20m x 10m.

**23BE1052 - Unidentified Prehistoric**

This site is a lithic scatter discovered on a heavily eroded ridgeslope situated 60m northeast of a small arm of the reservoir marking the former course of an intermittent stream. All visible surface materials were collected and three shovel tests were dug to determine site boundaries. Two flakes were recovered from among the cherty gravel outwash. The shovel tests yielded no additional artifacts. Site size was estimated to be 2m x 2m.

## Henry County (HE)

### 23HE865 - Early Archaic, Late Archaic, Woodland

This site is a lithic scatter found on the first terrace of the west fork of Tebo Creek. The site is approximately 35m to the east of Tebo Creek. The site was discovered during the inspection of a plowed field. It was found that the site was made up by one concentration approximately 30m in diameter with several other artifacts dispersed throughout the field. The presence of relatively few artifacts made it possible for a total collection to be made. In the concentration, the flakes were picked up, while the position of all tools and cores were mapped. Outlying artifacts were also plotted relative to the major concentration. Flakes, bifaces, hafted bifaces and cores were among the artifacts collected. Site size was estimated to be 55m x 30m.

Three diagnostic hafted bifaces were collected from this site. The first of these specimens is similar to Categories 368, 369 and 370, each of which is representative of an Early Archaic type (Goldberg and Roper 1981:21). The remaining two types are representative of Categories 341 (Etley) and 309. Etley points have been found in deposits radiocarbon dated to the Late Archaic. Category 309 has been excavated from stratigraphic units whose radiocarbon dates are representative of the Woodland Period (Goldberg and Roper 1981:42; 62).

### 23HE866 - Unidentified Prehistoric

This site was a lithic scatter found during a walkover of agricultural fields. The site is situated on the edge of the first terrace of the west fork of Tebo Creek. After determination of the boundaries of the site, it was decided to collect the site in one provenience, because the scatter was too sparse to employ the random collection techniques. Flakes, bifaces, and a hafted biface were recovered. Site size was estimated to be 60m x 24m. One hafted biface was recovered which could not be assigned to any categories with the Golberg and Roper (1981) typology. This specimen was placed into Category 408.

### 23HE867 - Late Archaic-Woodland

This site is a lithic scatter located on the edge of the first terrace approximately 100m to the northwest of Tebo Creek. Initial discovery was a result of a surface inspection of cultivated fields. Upon further assessment of site size and artifact density, it was decided to sample using the transect strategy. Flakes, chunks, a hafted biface and bifaces were collected in three collection units arranged along a single transect. Site size has been estimated at 130m x 25m.

A single hafted biface was collected from this site, which proved to be similar to Categories 310 and 311 (Cooper variants). This particular point has been found in association with Late Archaic and Woodland components (Goldberg and Roper 1981:63).

**23HE868 - Unidentified Prehistoric**

This site is a lithic scatter found during a walkover survey of agricultural fields. The site is on the first terrace of Tebo Creek, which is located 100m to the east. Close inspection of the site revealed it as being a light and dispersed scatter. It was decided that all artifacts would be collected in one collection provenience. Flakes and chunks were the only artifact classes present. Site size was estimated to be 30m x 40m.

**23HE869 - Unidentified Prehistoric**

This site is a lithic scatter discovered during a walkover of agricultural fields. The site is on the first terrace to Tebo Creek, which lies 20m to the east. The distribution of artifacts was found to be scattered and sparse and these were collected in one provenience. Flakes and chunks were recovered. Site size was estimated to be 20m x 20m.

**23HE870 - Unidentified Prehistoric**

This site is a lithic scatter found during a walkover survey of agricultural fields. The site is located on the slope between the floodplain and the first terrace above Tebo Creek. The creek is located 500m to the east of the site. After the first observation of cultural materials, a detailed inspection of the area was conducted. This revealed the site to be a dense scatter roughly circular in shape, and, for this reason, the circular collection strategy was used. Flakes, chunks and cores were collected from four collection units. Site size was estimated to be 64m x 60m.

**23HE871 - Unidentified Prehistoric**

This site is a lithic scatter situated on a first terrace of Sand Creek. The site is located approximately 500m to the south of the creek. During a walkover survey of agricultural lands, this site was encountered and intensively inspected. It was found to have fewer than 30 items present on the surface. Because of this, a total collection was made. Flakes were the only class of artifacts present. Site size was estimated to be 43m x 30m.

**23HE872 - Unidentified Prehistoric**

This site is a lithic scatter found on the slope between the floodplain and first terrace. The site is located 350m to the north of Tebo Creek. From a intensive inspection of the site following its discovery during a walkover survey of agricultural fields, the site was seen to consist of approximately 25 flakes which were totally collected under one surface provenience. Flakes were the only artifacts found. Site size was estimated to be 25m x 14m. No diagnostics were found.

**23HE873 - Unidentified Prehistoric**

This site is a lithic scatter found on the slope between the floodplain and first terrace of Tebo Creek, which is 200m to the south. The site, discovered during the surface inspection of a plowed field, was found to be best sampled with the use of

the circular strategy. Flakes, a fragement of a hafted biface and piece of hematite were collected in four collection units. Site size is estimated to be 32m x 90m.

One hafted biface was recovered from this site and was classified as Category 364, which refers to projectile points that are corner-notched but too damaged to be assigned to a specific category.

**23HE874 - Middle-Late Woodland**

This site is a lithic scatter situated on the edge of the first terrace about 100m east of Tebo Creek, and to the north of a substantial hill on the first terrace. The site was located during systematic walkover of plowed fields. A more detailed inspection revealed the site to be a large but very sparse scatter. The area of highest density, a small ridge running east to west through the southern portion of the field, was chosen for the placement of a sampling transect. Other items not included within collection units were individually plotted and collected as well. A total of five proveniences were used to collect artifacts which included flakes, cores, chunks, hafted bifaces, a biface and a uniface. Site size was estimated to be 120m by 380m.

Three hafted bifaces were collected from this site, two of which were too fragmentary to be assigned to any category except for 999. The third specimen, however, has been classified as a Rice Side-notched (Category 325) after Goldberg and Roper (1981:26). Rice Side-notched points occurred during the Middle and Late Woodland periods according to stratigraphic evidence and radiocarbon and thermoluminescence dating (Goldberg and Roper 1981:27).

**23HE875 - Unidentified Prehistoric**

This site is a lithic scatter found on the floodplain approximately 30m to the south of Barker Creek. During a walkover of agricultural fields the site was first encountered. After careful inspection to define site contents and boundary, a transect strategy was employed to sample the site. Since the field was in winter wheat about 40 cm -70 cm high, only a portion of the site was available for the sampling procedures. One transect with two collection units was used to collect artifacts that included flakes, cores, and chunks. In addition, two other artifacts were pieceplotted. Site size is estimated to be 35m by 90m.

**23HE876 - Unidentified Prehistoric**

This site is a lithic scatter located on the floodplain bordering on the edge of the first terrace of Barker Creek 60m north of the creek. The site was encountered while performing walkover survey in agricultural fields, was closely inspected and found to be widely distributed but very sparse. A total collection was made of the site with designation of artifact placement on the site map. Flakes, chunks and one biface were collected. Site size is estimated to be 150m by 230m. No diagnostics were found.

**23HE877 - Unidentified Prehistoric**

This site is a lithic scatter located on the first terrace of Tebo Creek, approximately 150m to the southeast of the creek. The site area is presently fallow, but ground visibility was good enough to permit a general walkover survey. After the site was discovered and the boundaries determined, the circular collection method was chosen. The collection effort recovered flakes, cores, chunks, and bifaces from four collection units or through the pieceplotting of four additional individual items. Site size was estimated to 37m by 50m.

**23HE878 - Unidentified Prehistoric**

This site is a lithic scatter found during shovel tests in an overgrown agricultural field. The site is located on a slope on the edge of the South Grand arm of the reservoir. A small unnamed intermittent is located about 100 meters to the west of the site. The site had a total of eight shovel tests dug to a depth of 50cm. Three shovel tests yielded flakes, chunks and cores. These shovel test were all positioned around the ridgenose closest to the intermittent. Although most of the field had a dense ground cover, surface materials were collected from a farm road that bisected the site. Site size is estimated to be 40m x 20m.

**23HE879 - Late Woodland-Protohistoric**

This site is a lithic scatter discovered during shovel testing in forested areas. The site is 100m to the east of Rose Creek, on the edge of the second terrace. After the initial discovery of artifactual materials, eight shovel test were placed at 15 meter intervals around the first hole. A total of two shovel tests were found to contain cultural material. Flakes and a small triangular biface were recovered. It was not possible to conduct a surface collection due to low ground visibility. Site size was estimated to be 15m x 1m.

Only a single hafted biface was collected from this site. The specimen was classified as a Category 334 (Fresno). Radiocarbon dates from three excavations, in addition to stratigraphic information, indicate that Fresno points are present in the Late Woodland and particularly in the Protohistoric period (Goldberg and Roper 1981:73-74).

**23HE880 - Unidentified Prehistoric**

This site is a lithic scatter found while conducting a walk-over survey of plowed agricultural fields. The site is located on the edge of the first terrace above Deer Creek, which once flowed about 200 meters to the east of the site. The reservoir is presently abutting the site on the east. After close inspection of the site, all surface material was collected as one general provenience. Shovel testing was conducted on a portion of the site not presently under cultivation. Of the nine shovel tests dug to 50cm, three were found to contain artifacts. Flakes and chunks were the only artifacts encountered. Site size was estimated to be 70m x 30m.

**23HE881 - Unidentified Prehistoric**

This site is a lithic scatter in a plowed agricultural field situated on the second stream terrace above Deer Creek, which borders the site on the west side. The South Grand is approximately 200m to the west. After an intensive assessment of the site, it was decided to collect all artifacts in one general surface provenience. Flakes, chunks and a uniface were collected. Historic ceramics and evidence of bulldozed house remains were also present near the site. Site size was estimated to be 60m x 45m. No diagnostic artifacts were encountered.

**23HE882 - Unidentified Prehistoric**

This site is an isolated find. The site, consisting of a biface fragment, is located 200 meters to the east of Coal Creek on the first terrace. An intensive inspection of the vicinity revealed no additional artifacts.

**23HE883 - Unidentified Prehistoric**

This site is a lithic scatter located during walkover of planted agricultural fields. The site is situated between Dumpling Creek and the South Grand River, approximately 200m to the north of the confluence, on the first terrace. Presently, the shoreline of the reservoir is 25 meters to the south of the site. Subsequent inspection of the site enabled surveyors to choose the transect strategy for site sampling. Four transects were oriented east to west across the site. Flakes, chunks and a hafted biface were collected in eight sample collection units and one individually plotted artifact. Site size was estimated to be 147m by 110m.

One hafted biface was recovered from this site, a basal notched point. This specimen was found to be different from anything described by Goldberg and Roper (1981), it was placed within Category 402, potentially diagnostic corner-notched point.

**23HE884 - Unidentified Prehistoric**

This site is a lithic scatter located in a fallow agricultural field situated on a ridgeslope above the Grand River, which is approximately 600m to the south. The site is now on the shoreline of the reservoir. It was determined that a total surface collection could be employed. Flakes, chunks, bifaces and a hafted biface were collected. Site size was estimated to be 140m by 45m.

**23HE885 - Unidentified Prehistoric**

This site is a lithic scatter located in an abandoned agricultural field situated on a slope 250 meters to the west of the South Grand. Visibility was good enough to permit a total collection of this sparse scatter. Flakes and chunks were recovered. Site size was estimated to be 80m by 50m. No diagnostic artifacts were collected.

**23BE886 - Unidentified Prehistoric**

This site is an isolated find of a biface. The site is located in a planted field on the first terrace of Marshalls Creek about 300m to the west of the creek. Further inspection of the immediate vicinity revealed no additional artifacts.

**23HE887 - Unidentified Prehistoric**

This site is an isolated find located in prairie upland areas. The site is located 400m to the northwest of Deepwater Creek. Further survey of the agricultural area in which this artifact, a biface, was found revealed no additional artifacts.

**23HE888 - Unidentified Prehistoric**

This site is a sparse lithic scatter found on the floodplain during a walkover survey of cultivated fields. The site is located approximately 125m east of Coopers Creek. An intensive inspection of the area revealed that the site consisted of one dense concentration, about 5m x 5m in size, with other flakes dispersed over a wide area. It was decided that a total surface collection should be made. Site size was estimated to be 260m by 50m. No diagnostic artifacts were found.

**23HE889 - Unidentified Prehistoric**

This site is a lithic scatter found during shovel testing of pastureland. The site is located on the floodplain of Coopers Creek, about 100m southeast of the creek. After the initial discovery, additional shovel tests were dug in 10m intervals away from tests with cultural materials present. All shovel test were dug to a depth of 50cm, but artifactual materials appeared to be present at approximately 30cm in depth. Flakes were found in two of eight shovel tests. Site size was estimated to be 10m by 5m. No culturally diagnostic artifacts were recovered on this site.

**23HE890 - Unidentified Prehistoric**

This site is located on the edge of the first terrace of Coopers Creek, about 20 meters to the east of the creek in a recently mowed fescue field, which resulted in good surface exposure. An intensive inspection of the field revealed that the artifacts were in a light scatter distributed along the slight rise of the terrace. A total surface collection was employed along with plotting locations of several tools. Flakes, bifaces and cores were recovered. Site size was estimated to be 320 meters by 60 meters.

**23BE891 - Unidentified Prehistoric**

This site is a lithic scatter found on the floodplain of Coopers Creek, about 100m to the southeast of the creek in a field of corn. It was decided to use one surface provenience to collect this site. Flakes, bifaces and a uniface were picked-up. Site size is estimated to be 200 meters by 200 meters.

**23HE892 - Late Archaic-Woodland**

This site is a lithic scatter found on the first terrace of Deepwater Creek. The site is situated 30m north of a small unnamed intermittent stream. Intensive inspection of the area revealed that the site was composed of two concentrations, each located on a small rise separated by the stream. Since the scatters were very sparse, a general surface collection was employed, one provenience being assigned to each of the concentrations. Flakes, cores, chunks, bifaces and a hafted biface were collected. Site size is estimated to be 200m by 100m.

The hafted biface was classified as a Category 331. In their discussion of this type, they note that these are similar to the Gary and Standlee points, but that a positive identification is not possible due to the fact that these points have broken bases. These points occur with both Gary and Standlee points in closed contexts at the Cootie Site (23BE676) (Goldberg and Roper 1981:49-50). Based on this it can only be said that the site was occupied either during the Late Archaic or Woodland periods.

**23HE893 - Early Archaic, Late Archaic-Woodland**

This site is a lithic scatter found on the second terrace of Deepwater Creek in a planted agricultural field about 50m to the north of a small intermittent creek. After an intensive survey of the site area, it was decided that the scatter was extensive enough to require a transect sample. Two collection units were used to recover flakes, bifaces, cores, hafted bifaces and chunks. Site size was estimated to be 73m by 40m.

Two hafted bifaces were found to be diagnostic from this site. One was similar to Category 332 (Standlee), which occur in Late Archaic and Woodland assemblages. The other specimen was placed in Category 368 which has been assigned to the Early Archaic period (Goldberg and Roper 1981:47; 21).

**23HE894 - Late Archaic-Woodland, Late Woodland**

This site is a lithic scatter found in agricultural land on the floodplain of Deepwater Creek. The site is located on small knolls about 75 meters north of the creek. An intensive survey revealed that the site had three major concentrations. These major concentrations are the loci for almost all of the artifactual materials present on the site, there is very little between these areas. The three loci were each collected differently. Locus 1 had only one general surface collection done; Locus 2 was collected by means of the circular strategy; Locus 3 was sampled with the transect strategy with seven additional individual tools collected as well. Flakes, cores, chunks, hafted bifaces, bifaces and unifaces were collected from a total of sixteen provenience units. Site size is estimated to be 480m by 300m.

A total of seven hafted bifaces were collected from this site, of which one was too damaged to be categorized. Four specimens, which included one each from Category 332 (Standlee), Category 325 (Rice Side-notched), Category 306, and Category 309, indicate Late Archaic to Woodland period affiliations. Of the two remaining, one was assigned to Category 314, potentially diagnostic, and the other

was assigned to Category 364, but was too damaged to be classified further (Goldberg and Roper 1981).

**23HE895 - Unidentified Prehistoric**

This site is a lithic scatter located on the floodplain of Deepwater Creek about 150m east of the confluence of Deepwater Creek and an unnamed intermittent. Surveyors were directed to this site, which is in a cultivated field, by the owner of this piece of easement property. After a survey to determine site extent and artifact density, it was decided to use a transect sampling strategy. A total of six collection units were placed along two transects. Flakes and chunks were found. Site size is estimated to be 180m by 80m.

**23HE896 - Unidentified Prehistoric**

This site is a lithic scatter found on the floodplain of Deepwater Creek about 100m south of the creek in a cut wheat field. After an intensive inspection, the site was collected as one surface provenience. Flakes were the only artifact class found. Site size is estimated to be 60m by 10m.

23HE897 - Unidentified Prehistoric

This site is a lithic scatter found on the floodplain of Bear Creek in a fallow field subject to heavy erosion, due to land borrowing activities related to new highway construction. A general surface collection was employed, with the site being divided into two loci, one collection unit was east of a drainage ditch, while the second was on the west side. Flakes, chunks, and bifaces were recovered. Site size was estimated to be 30m by 10m.

**23HE898 - Unidentified Prehistoric**

This site is an isolated find of one flake found on the first terrace of an unnamed intermittent stream. The site is located 100m east of the stream in agricultural land.

**23HE899 - Unidentified Prehistoric**

This site is a lithic scatter located during a survey of cultivated fields. The site is situated on a ridge slope above the South Grand River, which is approximately 75 meters west. The site was sampled with the use of the circular strategy. Flakes, cores, chunks, bifaces and unifaces were collected. Site size was estimated to be 80 meters by 45 meters.

**23HE900 - Unidentified Prehistoric**

This site is located on the second terrace of the South Grand River, which is about 200 meters west of the site. The site area was being cultivated in corn at the time of the survey. A walkover of the site indicated that the scatter of artifacts here extended over an area approximately 80m by 100m in size. Because the site is not located within the Ten-Year Floodpool ( it is at an elevation of 735 to 738 feet above sea level), no collections of artifacts were made.

**23HE901 - Unidentified Prehistoric**

This site is a lithic scatter found during walkover survey of agricultural fields on a second terrace of the South Grand. It is now only about 60m from the shore line of the reservoir. Originally, the South Grand was approximately 100m northeast of the site. After intensive investigation of the artifact distribution, it was found that the site could be dividied into two major concentrations. The two concentrations were collected as Locus A and Locus B. Flakes and chunks were the only artifact classes present. Site size is estimated to be 120m x 30m.

**23HE902 - Unidentified Prehistoric**

This site is a lithic scatter found during shovel testing of pasture land on a slope overlooking the South Grand arm of the reservoir which is 20m to the south. The South Grand originally was approximately 200m to the south. The site was initially found while inspecting areas around an old farm road during shovel testing. Additional shovel tests were placed in cardinal directions radiating out from the road. Flakes were recovered in four of the shovel tests as well as from one surface collection provenience. Site size is estimated to be 25m by 25m.

**23HE903 - Unidentified Prehistoric**

This site is a lithic scatter found while inspecting open areas around a recently built powerline. It is located approximately 100m northeast of the original position of the South Grand. The site is now 75m from the reservoir's shoreline. All artifacts were found in the open areas around the power line and were given one surface provenience. Several shovel tests were dug to a depth of 50cm but yielded no additional materials. Site size is estimated to be 30m by 15m.

**23HE904 - Unidentified Prehistoric**

This is a lithic scatter found in a plowed agricultural field. The site is situated on a ridge slope above the South Grand River, which at one time flowed 170m to the north. Presently the reservoir is from 10 to 20 meters to the east and north of the site. The site was divided into two major concentrations after an intensive walkover of the immediate vicinity. A section line was used to further bisect the large concentration into two portions. Flakes, chunk, biface fragments and other lithics were recovered in the three collection loci. Site size was estimated to be 90m by 24m. No diagnostics were collected.

**23HE905 - Unidentified Prehistoric**

This site is a sparse lithic scatter found during survey of plowed agricultural land located on a small knoll on the first terrace about 50m south of HE908. Barker Creek is approximately 75m east of the site. Collection of the site was restricted to one surface provenience. Flakes, cores and bifaces were collected. Site size is estimated to be 30m by 30m.

**23HE906 - Unidentified Prehistoric**

This site is a sparse lithic scatter found during a survey of agricultural land. The site is located 100m to the east of Barker Creek on the first terrace. After the site boundaries were determined, it was decided to collect all materials in one provenience. Site size was estimated to be 30m x 75m. No diagnostics were found.

**23HE907 - Late Archaic-Woodland**

This site is a lithic scatter discovered during a survey of agricultural land. The site is situated on a small knoll 150m to the east of Barker Creek. This site is 100m to the north of HE906. A total surface collection was conducted after an intensive walkover. Flakes and one hafted biface were collected. Site size is estimated to be 20m by 35m.

A single specimen classified as Standlee (Category 332) was collected from this site. The presence of this type of point on the site suggests a Late Archaic period or Woodland period occupation. (Goldberg and Roper 1981:46-47).

**23HE908 - Unidentified Prehistoric**

This site is a lithic scatter discovered during a survey of agricultural land. The site is situated on a small knoll 100m west of Barker Creek on the first terrace. After an intensive inspection of the site, it was found that the artifact scatter was very sparse. A total surface collection was done. Flakes, chunks and bifaces were collected. One core was also found outside of the site boundaries, and was plotted and included in the collection. Site size was estimated to be 40m by 180m.

**23HE909 - Unidentified Prehistoric**

This site is an isolated find collected from a walkover survey of agricultural fields. The site is located in prairie upland areas and is about 350m east of a small intermittent stream. An intensive search was conducted but no additional materials were found.

**23HE910 - Unidentified Prehistoric**

This site is a lithic scatter located on the floodplain of Fields Creek. The site situated on a small knoll in the middle of cultivated agricultural fields. The site, has been impacted by the bulldozing of a house structure nearby. Collection of the site was done by dividing the site into four quadrants. A total surface collection was employed for each quadrant. Flakes were the only artifacts recovered. Many historic artifacts were present in association with a home site. Site size was estimated to be 100m by 100m. No diagnostic artifacts were found.

**23HE911 - Unidentified Prehistoric**

This is a lithic scatter that is spread along the edge of slope above the West Fork of Tebo Creek, which is located approximately 200m southwest. Closer examination helped to establish the site boundaries and site structure. It was

decided that a transect sample in conjunction with pieceplotting tools not included in sample units would be employed to sample the site. Flakes, cores, chunks and bifaces were collected from five sample units and four artifacts were individually plotted. Site size was estimated to be 250m x 20m.

**23HE912 - Unidentified Prehistoric**

This site is a lithic scatter located on two knolls on the floodplain of Deepwater Creek. The site is situated about 50m to the north of Deepwater Creek. Surveyors were directed to this site, which is in a cultivated field, by the owner who farms this piece of land. Acting on his information surveyors were able to walkover the field and locate all portions of the site. One transect, with tow collection units, was employed to sample the site. Flakes, chunks and surface fire cracked rock was collected by surveyors. Site size was estimated to be 150m by 50m.

**23HE913 - Unidentified Prehistoric**

This site is a lithic scatter found in a open area during shovel testing of an old field situated on a slope 300m west of an unnamed intermittent which flows into the Osage River. A substantial amount of area was turned up on the stream bank, revealing many natural chert chunks, but only a flake and hafted biface were found. Further investigation was conducted to find additional artifacts and delineate site boundaries, but added no new materials. Site size was estimated to be 20m by 30m. One hafted biface was collected. It was classified as a Category 344 (Nebo Hill), which is associated with Late Archaic assemblages (Goldberg and Roper 1981:15).

**23HE914 - Unidentified Prehistoric**

This site is a lithic scatter discovered during shovel testing and is situated on a second terrace of the Osage River approximately 10m north of the reservoir shoreline and 20m west of an intermittent stream. Three shovel tests spaced 20m apart, in a triangular configuration, were dug to a depth of 50cm. Flakes were found in two of the shovel tests. Historic materials were also present. The site is located in an abandoned agricultural field covered with dense vegetation, preventing a surface collection. Site size was estimated to be 50m by 50m.

**Hickory County (HI)**

**23HI478 - Unidentified Prehistoric**

This site is a lithic scatter found during an inspection of open ground during shovel testing of forested land. The site was located on the first terrace 50m to the south of the Pomme de Terre River and is restricted to the edge of the terrace. After a surface collection was made, shovel tests were used to establish the boundaries of the site in the forest. Four shovel tests yielded flakes and chunks. Site size was estimated to be 40m by 40m.

**23HI479 - Late Archaic-Woodland**

This site is a lithic scatter found in an agricultural field on the floodplain of the Pomme de Terre River. The site is situated 40m north of the river. Agricultural land, it was decided that the site was large enough to employ the circular collection strategy. Four collection units were used to collect flakes, cores, chunks and unifaces. Site size is estimated to be 30 meters in diameter. No cultural affiliations can be described for the site at this time.

Two diagnostic hafted bifaces were found on this site. These were classified as a Cooper variant (Category 332) and a Standlee (Category 310, 311). Both of these have been found on sites within the reservoir in Late Archaic and Woodland contexts. (Goldberg and Roper 1981:63-64; 47).

**23HI480 - Unidentified Prehistoric**

This site is a lithic scatter found during shovel testing in a heavily wooded forest. The site is located on a slope 30m south of the Pomme de Terre River. After the initial discovery of cultural materials, a series of shovel tests were dug to a depth of 50cm to determine site size. A total of thirteen shovel tests were dug, of which ten yielded cultural material, including flakes and unifaces. Site size is estimated to be 100m by 30m.

**23HI481 - Unidentified Prehistoric**

This site is a lithic scatter discovered on the first terrace 100m north of the Pomme de Terre River. Initially discovered during a walkover survey of plowed agricultural land, the site was further inspected to define site size, shape and artifact distribution, resulting in the selection of the linear strategy to sample the site. Two transects were laid out across the site, east to west. On each transect four collection units were randomly placed. Flakes, chunks, cores, bifaces and unifaces were collected from the site. Site size is estimated to be 175m by 45m. No diagnostic artifacts were collected.

**23HI482 - Woodland**

This site is a lithic scatter found on the first terrace of the Pomme de Terre River. After an inspection of the site to determine artifact distributions and delineate boundaries of the site it was decided that a circular collection strategy should be employed in conjunction with the plotting of individual artifacts. A total of four collection units were randomly placed within the circular collection unit, and thirteen individual artifacts were flakes, piece plotted cores, chunks and a hafted biface were recovered. Site size was estimated to be 70m by 68m.

A Category 309 hafted biface was found here. According to Goldberg and Roper, these forms have been found in stratigraphic context at sites 23BE337 and 23HI297 and have been dated to the Woodland period (1981:62-63).

**23HI483 - Late Archaic-Woodland**

This site is a lithic scatter found on the first stream terrace adjacent to and north of the Pomme de Terre River. Before the site was collected, a walkover of the general area was conducted with a subsequent intensive inspection of the site designed to determine site size and extent. It was decided that a transect strategy be employed to sample the lithic scatter. One transect was laid out on the site with our collection units randomly arranged along it. Flakes, cores, chunks, bifaces, unifaces and hafted bifaces were recovered from the site. Site size was estimated to be 450m by 30m.

A total of three diagnostic artifacts were recovered from this site. Two hafted bifaces were classified as Categories 327, 328, Truman Broadblade, as described by Goldberg and Roper (1981:35). Examples of these types have been found in Rodgers Shelter, as well as during survey, and have been assigned to Late Archaic and Woodland periods. Category 328 specimens have been dated by thermoluminescence (Goldberg and Roper 1981:36-37). The third artifact was placed in Category 364, 19 for corner-notched hafted bifaces which are too damaged to permit a precise identification (Goldberg and Roper 1981:70-71).

**23HI484 - Late Archaic, Late Archaic-Woodland, Middle Woodland, Late Woodland**

This site is a lithic scatter found on the first and second terraces of the Pomme de Terre River. The site is situated between two unnamed intermittent streams to the east and west and is bordered on the south by an old meander channel of the Pomme. The river now flows approximately 300m south of the site. The initial discovery of the site was made during a walkover survey of planted agricultural fields. Further investigations to establish boundaries and artifact concentrations revealed the site to be extensive. It was decided that a transect sampling strategy would be best employed here.

Six transects were randomly placed on the site, running east to west. Each transect had a number of collection units and also individual artifacts being plotted onto the site map and given provenience. A total of twenty-nine collection units were used in conjunction with twenty-six individual artifacts given provenience. Flakes, cores, chunks, bifaces, unifaces and hafted bifaces were collected from the site. Site size was estimated to be 365m by 150m.

Twenty-seven whole or fragments of hafted bifaces were collected from this site. Most of these could be classified within the Goldberg and Roper (1981) typology. Several specimens that could not be classified were assigned to new categories. A description of assigned categories, and the total populations within each, follow.

Category 335 (Sedalia) n=2. This type has been assigned to the Late Archaic period, having been dated by thermoluminescence to 2222 ± 391 B.C. at 23HI297 (Goldberg and Roper 1981:14).

Category 307 (Afton) n=3, Afton points have been found in Late Archaic contexts in a number of sites (Wood 1961; Purrington 1971; Kay 1978) and has also

been found in dated Woodland contexts as described by Goldberg and Roper (1981:60).

Category 339 (Etley variant A) n=2. Etley has been tentatively placed in the Late Archaic period based on radiocarbon dates from the excavation of a site, 23HI297, in the reservoir. (Goldberg and Roper, 1981:42).

Category 325 (Rice Side-notched) n=4. These have been placed into the Late Woodland period based on thermoluminescence dates of A.D. 483 ± 144 and A.D. 397 ± 152 at 23HI297 (Goldberg and Roper 1981:27).

Category 306 n=1. This type has been classified as a Late Archaic/ Woodland point, first described from Rodgers Shelter by Kay (1978), and placed in his Category 14 (Goldberg and Roper 1981:54).

Category 330 (Gary) n=2. Found in an excavation conducted in the reservoir, Gary points were associated with a Late Woodland component at 23BE676 (Goldberg and Roper (1981:46).

Category 317 (Snyders) n=1. Snyders points are found associated with Kansas City Hopewell and are considered a horizon maker for the Middle Woodland. (Goldberg and Roper 1981:65).

Category 322 (Scallorn) n=1. This type is first encountered in Late Archaic deposits, but is also believed to be used continuously up until the European contact period. (Goldberg and Roper 1981:72).

Category 999 n=4. This category has been created for fragments too damaged to be placed into diagnostic categories.

Category 400 n=3. This type of corner-notched point was different from those reported by Goldberg and Roper (1981). It is considered to be potentially diagnostic.

Category 404 n=1. This category is made up of side-notched points that could not be placed into Goldberg and Roper's (1981) typology. It is considered to be potentially diagnostic.

Category 406 n=1. This category is made up of bifaces that are believed to be potentially diagnostic, but are not described by Goldberg and Roper (1981).

**23HI485 - Unidentified Prehistoric**

This site is a lithic scatter found by shovel testing in pastureland. The site is located on the third terrace above the Pomme de Terre River, which flows 60m to the east of the site. After the initial discovery of the site a series of shovel tests, dug to 50cm, were placed in 15m intervals. A total of ten shovel tests were dug, of these eight yielded cultural artifacts. Flakes, chunks and one biface fragment were recovered. No surface collection could be conducted due to the high density of the surface vegetation.

**23HI486 - Unidentified Prehistoric**

This site is a lithic scatter found by shovel testing conducted around the margins of a wheat field. The site is located 10m north of a small unnamed intermittent stream. The Pomme de Terre is located 150m north of the site. The site was found on the periphery of the wheat field. Further shovel tests, however, revealed no additional information. A surface collection was not possible due to the lack of ground visibility in and out of the wheat field. A uniface was found in only one of the shovel tests. Site size was estimated to be 5m by 5m.

**23HI487 - Late Archaic, Late Archaic-Woodland, Late Woodland**

This site is a lithic scatter found on levee of the Pomme de Terre River between two intermittent streams to the east and west, while the Pomme de Terre is located 25m north of the site. An intensive survey was conducted to delineate site boundaries and locate artifact concentrations. It was found that the site was centralized along an old levee that ran the length of the plowed field, a field of wheat and some pastureland. The area with the most visibility was the plowed field. Three transects were selected and laid out east to west. A total of thirteen collection units and thirteen individually collected artifacts were given provenience. The wheat field had limited visibility, so a general surface collection was conducted. Finally, the pasture was shovel tested for evidence of a continuation of the site, but no additional artifacts were recovered. Flakes, cores, chunks, bifaces, unifaces and hafted bifaces were recovered. Site size was estimated to be 650m by 75m.

This site is a multicomponent site, from which a total of sixteen hafted bifaces were collected. Each specimen was placed into either categories based on Goldberg and Roper (1981) typology or in a series of new categories created for these types not accomodated by the Goldgerg and Roper typology. The categories present on the site are listed below.

Category 307 (Afton) n=1. Ambiguity exists concerning the actual placement of Afton points into a cultural framework. Several excavations and radiocarbon dates from reservoir sites, however, seems to indicate Late Archaic to Woodland time frame (Goldberg and Roper 1981:59).

Category 306 n=1. This point type was first described as being from a Late Archaic/Woodland period by Kay (1978). At Site 23HI297, it was found in stratigraphic context in association with Late Archaic forms (Goldberg and Roper 1981:54).

Category 325 (Rice side-notched) n=2. These have been dated to around 1000 AD, placing this type in the Late Woodland period. (Goldberg and Roper 1981:27).

Category 332 (Standlee) n=1. Standlee are believed to be predominately distributed in Late Archaic contexts, but also are observed until the Late Woodland (Goldberg and Roper 1981:47).

Category 343 (Waubesa) n=1. These points have been described for a wide range of sites, from Late Archaic to Middle Woodland period (Ritzenthaler 1967:27; Perino 1971:98).

Category 322 (Scallorn) n=2. Scallorn points were encountered in an excavated context at 23HI297. Radiocarbon dates from that excavation indicated the placement of this type within the Late Woodland. Archeological information from other sites also suggests that the use of Scallorn type bifaces extended into protohistoric times (Goldberg and Roper 1981:72).

Category 323 (Reed) n=1. This point type is believed to occur during the Late Woodland period (Bell 1958:76). These are associated with Scallorns at one site in the reservoir (23HI297), which yielded dates indicating a Late Woodland affiliation (Goldberg and Roper 1981:73).

Category 327 (Truman Broadblade) n=1. This type has been found at Rodgers Shelter, where it was assigned to a Woodland period, and also in several excavated sites in the reservoir, where it appears to be associated with Late Archaic and Woodland assemblages (Goldberg and Roper 1981:36-37).

Category 400 n=2. This corner-notched point is not included in Goldberg's and Roper's (1981) typology. It is, however, considered to be potentially diagnostic.

Category 406. This point is a potentially diagnostic biface, not categorized in Goldberg and Roper (1981).

The presence of these projectile points indicates that this site was occupied from the Late Archaic to the latter part of the Woodland period in this area.

**St. Clair County (SR)**

**23SR966 - Unidentified Prehistoric**

This site is a lithic scatter found during shovel testing in pastureland. The site is situated on the edge of a ridgenose approximately 250m south of the Osage River. Several flakes were found, warranting additional shovel tests to define site boundaries and whether or not the site had a subsurface component. The soil was found to be very rocky, but artifacts were present. Flakes and a biface fragment were collected. Site size was estimated to be 65m by 30m.

**23SR967 - Unidentified Prehistoric**

This site was found during shovel testing of a hay field. The site is situated on a ridgenose 100m south of the Osage River. After the initial discovery of artifacts in a shovel test, additional tests were dug from the first test in regular intervals to determine site extent. Eight shovel tests were found to contain artifacts, which included a hafted biface, flakes, and chunks. No surface collection was made because of the dense ground cover. Site size was estimated to be 80m by 60m.

A Category 306 projectile point was found at this site. Goldberg and Roper note that this category is similar to Kay's (1978:8-35) Category 14, which are found

at Rodger's Shelter in Late Archaic and Woodland contexts. In addition, they note the association of this point with Etley, Sedalia, Table Rock Stemmed, and Smith points at Site 23HI297 (1981:54).

**23SR968 - Unidentified Prehistoric**

This site is a lithic scatter found during shovel testing in a hayfield on the first terrace approximately 620m west of Bear Creek. After the discovery of cultural materials in one of the shovel tests, the interval between tests was shortened and the area more heavily saturated. No additional shovel tests yielded any materials. Only two flakes were found. Site size is estimated to be 5m by 5m.

**23SR969 - Unidentified Prehistoric**

This site is a lithic scatter found during shovel testing of pasturelands. The site is located on the edge of a ridgenose approximately 310m southeast of the Osage River. Subsurface testing was conducted every 20m and at 10m (if material was found at 20m) in order to delineate the site boundaries. The site was found to conform nicely to the ridgenose, with sterile tests from shovel testing helping to define the southern boundary. Five shovel tests yielded artifacts including flakes and a biface. Site size was estimated to be 100m by 50m.

**23SR970 - Unidentified Prehistoric**

This site is a lithic scatter found during shovel testing of an old field situated on the first terrace 82m east of Bear Creek. Shovel tests were placed at regular intervals, in order to define site size, around the shovel test first found to contain cultural materials. A total of twelve shovel tests were found to contain artifacts including flakes, chunks, bifaces and a hafted biface. No surface collection was conducted due to the heavy ground vegetation. Site size is estimated to be 60m by 50m.

This site yielded a single hafted biface. The specimen, however, proved to be different of any of the categories outlined in Goldberg and Roper (1981). It was subsequently placed in a Category 400, potentially diagnostic corner-notched point.

**23SR971 - Unidentified Prehistoric**

This site is on the floodplain 100m south of Bear Creek in a recently harvested agricultural field. After finding the site during a walkover, a more detailed survey was conducted to delineate site boundaries and concentrations of artifacts. It was decided that the site was sparse enough to warrant a general surface collection. Flakes, cores and chunks were recovered from the site. Shovel tests were also dug, to a depth of 50cm, along the periphery of the field, but yielded no materials. Site size was estimated to be 10m by 30m.

**23SR972 - Unidentified Prehistoric**

This site is a lithic scatter found on the first terrace 250m to the east of Weaubleau Creek. The site was discovered during a walkover survey of a plowed agricultural field. An intensive survey was conducted to help define the density and

boundaries of the site. It was then decided that the site was sparse enough to warrant a total surface collection as one provenience. Flakes and chunks were the only artifacts recovered. Site size was estimated to be 150m by 120m. No diagnostics have been found.

**23SR973 - Unidentified Prehistoric**

This site was found during a shovel testing survey of pasturelands. The site is situated on the first terrace approximately 225m to the west of Weaubleau Creek. After the initial location of the site, a series of six regularly placed shovel tests were dug to establish site boundaries. Only one shovel test was found to have cultural materials. Flakes were the only artifacts recovered. Site size is estimated to be 15m by 15m.

**23SR974 - Unidentified Prehistoric**

This site is a lithic scatter found during shovel testing procedures conducted in a plowed field. The site is situated on the first stream terrace approximately 80m to the west of Weaubleau Creek. After the initial discovery of the site, a number of shovel tests were regularly spaced, in 10m intervals, from the first shovel test. A total of three shovel tests yielded artifactual materials, while demonstrating that the site conformed to the edge of the terrace. Limitied areas of surface exposure were found along the northern boundaries of the site in which one flake was found. Flakes were the only artifacts found in the shovel test as well. Site size was estimated to be 150m by 100m.

**23SR975 - Late Archaic**

This site is a lithic scatter found on the first stream terrace approximately 30m west of Weaubleau Creek. The site was found during a walkover survey of a cultivated agricultural field. An intensive survey was conducted to determine site size and areas of artifact concentrations. It was decided, that since this scatter was too sparse, to collect the whole site in one surface provenience. Four shovel tests were placed in a pasture area south of the plowed field, of which only one shovel test yielded artifactual materials. Flakes, chunks, cores, bifaces and hafted bifaces were all collected. Site size was estimated to 90m by 40m.

One hafted biface was recovered and classified after Goldberg and Roper. This specimen was found to be representative of Category 339 (Etley) and diagnostic of the Late Archaic (1981:41).

**23SR976 - Unidentified Prehistoric**

This site is a lithic scatter found on the first terrace approximately 500m west of Weaubleau Creek. The site was initially discovered during a walkover of a plowed field. After an intensive inspection of the site to delineate site boundaries and artifact concentrations, it was decided to collect this site in one general surface provenience. Flakes, cores, chunks and bifaces were all collected. Site size was estimated to be 150m by 50m.

**23SR977 - Unidentified Prehistoric**

This site is a lithic scatter found on the floodplain approximately 400m to the west of the Sac River. The site was found exposed on both sides of a channelized slough during a walkover survey of a recently harvested field. It was found that the site was small and sparse, lending itself well to a total surface collection. Flakes, chunks, and cores were recovered. Site size is estimated to be 35m by 15m.

**23SR978 - Unidentified Prehistoric**

This site is a lithic scatter located on the first terrace approximately 200m southeast of the Sac River. An intensive inspection delineated site boundaries. During this artifact concentrations were noted. As a result, it was decided to divide the site into three 25m x 25m loci, which were collected as a total surface collection. Shovel testing was also conducted in pastureland on a ridge top north of the plowed fields, yielding artifacts in all areas. Flakes, chunks, and bifaces were recovered. Site size was estimated to be 80m by 43m.

**23SR979 - Unidentified Prehistoric**

This site is a lithic scatter located on a slope above and approximately 300m west of the Sac River. The site was initially found during a survey of a cultivated field. Additional survey, to delineate site boundaries, revealed only one additional artifact. Only a hafted biface and flake were collected. Site size was estimated to be 41m by 1m. One hafted biface was recovered but could only be classified in Category 364 for unidentifiable corner-notched points (Goldberg and Roper, 1981:70).

**23SR980 - Unidentified Prehistoric**

This site is a lithic scatter found by shovel testing in a pasture. The site is located on a low north-south ridge on the first terrace 200m east of Coon Creek. Shovel tests were regularly spaced around the ridge, where the first artifacts were found, but all proved to be sterile more than 10m to the east or west. More shovel tests were also placed on the slope west of the ridge, which yielded artifactual materials. It was not possible to conduct a surface inspection on any portion of the field due to the density of ground vegetation. Flakes, cores, chunks and a hafted biface were recovered from the site. Site size is estimated to be 205m by 20m. A single hafted biface was recovered and was placed into Category 364 for unidentifiable corner-notched points (Goldberg and Roper, n.d.).

**23SR981 - Unidentified Prehistoric**

This site is a lithic scatter found while shovel testing in a pasture. The site is located on the first stream terrace approximately 150m north of Coon Creek. After the first artifacts were encountered, a series of regularly spaced shovel tests were situated around the first point of discovery. Of the sixteen shovel tests dug, seven were found to contain cultural materials. These tests were close to the edge of the terrace. A surface collection was also conducted in areas of good surface visiblity. Flakes were the only type of artifact encountered. Site size was estimated to be 90m by 40m.

### 23SR982 - Unidentified Prehistoric

This site is a lithic scatter located while shovel testing pasturelands. The site is located on the first terrace north of a slough and bordered on the south by the floodplain and Coon Creek, which is 50m away. A series of twelve shovel tests were placed on a 20m grid delineate the site boundaries. A total of eight of these tests yielded artifacts. Areas of high surface visibility yielded some artifacts, which were collected in two general surface proveniences. Flakes, chunks and a biface were recovered. Site size was estimated to be 60m by 60m.

### 23SR983 - Unidentified Prehistoric

This site is a lithic scatter found while shovel testing in a young stand of forest. The site is situated on a slope above Salt Creek, which is 35m east. This site was intensively inspected to determine concentrations and boundaries, and was decided that a linear transect strategy would be best used for a sample. One transect was used with two collection units randomly placed on it. Additional shovel tests also help to delineate the boundaries in the forested areas; one of which was found to have artifactual materials. Flakes and a biface were recovered. Site size is estimated to be 100m by 20m. No diagnostics were found.

### 23SR984 - Unidentified Prehistoric

This site is a lithic scatter found while conducting shovel testing in an old field. The site is located on a slope 50m to the west of Salt Creek. This particular area has been subjected to heavy erosion and had relatively good surface visibility. The site was initially found while inspecting open areas. Subsequent inspection of the site for boundaries and artifact densities enable the surveyors to select a circular sampling strategy. Several shovel tests were dug to determine site extent in areas with poor surface visibility, of which only one yielded artifacts. Flakes, chunks and a biface were found. Site size is estimated to be 40m by 30m. A single hafted biface was collected and classified as a Category 364, unidentifiable corner-notched points (Goldberg and Roper 1981:70).

### 23SR985 - Unidentified Prehistoric

This site is a lithic scatter found during shovel testing of a hayfield. The site is situated on the floodplain near the confluence of Panther Creek and Gallinipper Creek, which is to the northeast. After the initial discovery of the site, a series of fourteen shovel tests were dug on the floodplain, of which only three yielded artifacts. A surface inspection was conducted on a drainage ditch, that had recently been dug around the hay field, in order to determine the presence of artifacts and site boundaries. The ditch was divided into four perimeter quadrants and were grab sampled. Flakes and a biface were collected. Site size is estimated to be 300m by 100m.

### 23SR986 - Unidentified Prehistoric

This site is a lithic scatter found on the first stream terrace 35m southwest of Gallinipper Creek. The site was located during a walkover survey of a cultivated field. It was decided, after additional walkovers to determine site extent and

concentrations, that the site was sparse and would be collected as one surface provenience. The only artifacts found were flakes and a biface. Site size was estimated to be 25m by 5m. No diagnostics were collected from the site.

**23SR987 - Unidentified Prehistoric**

This site is a lithic scatter which was found in a planted agricultural on the floodplain of Gallinipper Creek. After the first artifacts had been observed, surveyors conducted an intensive inspection of all the field. The site proved to be a large and substantial scatter. A linear strategy was chosen to sample the site. Two transects were created on the site, one with four collection units and the second with three collection units. A number of individual artifacts were also piece plotted. Flakes, chunks, cores and bifaces were recovered in a total of 29 proveniences. The size of the site was estimated to be 130m by 55m. One hafted biface was collected. It was classified as an unidentifiable corner-notched point (Category 364, Goldberg and Roper 1981:70).

**23SR988 - Unidentified Prehistoric**

This site is a lithic scatter identified during a walkover survey in planted agricultural lands situated on the floodplain approximately 30m south of Gallinipper Creek. Site size and density of artifacts were ascertained by means of an intensive walkover conducted after the initial discovery. As a result of this inspection surveyors were able to classify the site as having a low density of artifacts spread over a large area. It was decided to collect the site in three general surface loci, to preserve some spatial information. Flakes and cores were collected. Site size was estimated to be 120m by 30m.

**23SR989 - Unidentified Prehistoric**

This site is a lithic scatter found on a slope above Gallinipper Creek, which flows 200m to the west. After a walkover survey of the agricultural field initially encountered cultural material, a more extensive inspection was undertaken to delineate the site boundaries and note artifact density and concentrations. Surveyors found that the site was very small, only 15m by 10m, with few artifacts. As a result, a total collection of all surface materials was conducted. Flakes were the only artifacts found.

**23SR990 - Unidentified Prehistoric**

This site is a lithic scatter found in a recently harvested agricultural field situated on the first terrace 100m southeast of an unnamed intermittent stream, which flows into the Osage River. An intensive inspection of the field revealed that the site was comprised of less than thirty flakes spread out over an area of 165m by 60m. It was therefore decided to make a general surface collection of the whole site. Flakes, cores, chunks and bifaces were found.

**23SR991 - Unidentified Prehistoric**

This site is a lithic scatter in an agricultural field situated on a slope 250m northeast of the Osage River. During an intensive survey of the vicinity, site size

was established and all artifact positions were located. It was decided that, since the site was a low density scatter, a collection of the site in a general surface provenience would be conducted. Flakes were the only artifacts collected in an area 65m by 35m.

**23SR992 - Unidentified Prehistoric**

This site is an isolated find discovered in a recently harvested field on the floodplain 200m east of the Osage River. Even though surveyors conducted an intensive inspection of the field, no additional artifacts were found after the biface was encountered.

**23SR993 - Unidentified Prehistoric**

This site is a lithic scatter found after a walkover survey of cultivated agricultural land situated on the first terrace adjacent to the Osage River. The site was intensively inspected to establish site size and to note location of artifacts. Surveyors found that the site was a light scatter, with only one real concentration along the northwest border of the site. It was decided to give two loci for this site, one for the concentration, the other of all remaining artifacts. Flakes, cores, chunks, a biface and a uniface were recovered during the general surface collection. Shovel tests were also dug in a grassy area to the west of the site, but no additional artifacts were found. It was estimated that site size was 100m by 25m.

**23SR994 - Unidentified Prehistoric**

This site is a lithic scatter found on a slope 15m to the north of an intermittent stream, which flows to the Osage. Surveyors first noted this site during inspection of open areas around an old farm road while conducting shovel testing. After a thorough inspection to identify the site boundaries, the site was collected in one surface provenience. Ten shovel tests were dug in a pasture to the south of the road. Three shovel tests yielded materials, thus providing additional data for an estimate of site size. Flakes, chunks, and a biface were recovered. Site size was estimated to be 100m by 100m. No diagnostic artifacts were found.

**23SR995 - Unidentified Prehistoric**

This site is a lithic scatter found on the floodplain 70m to the east of Yellow Creek. Surveyors discovered this site during a walkover of a cultivated field. Only three flakes and a uniface were located during an intensive inspection. All artifacts were collected in one surface provenience. The artifacts were found in an area measuring 60m by 15m. No diagnostic artifacts were found.

**23SR996 - Unidentified Prehistoric**

This site is an isolated find located during the walkover survey of a cornfield on a slope above the Osage River, which flows 300m to the southwest. After an intensive inspection of the site, to note the presence of additional artifacts and site boundaries, a uniface remained the only artifact encountered. No diagnostic artifacts were recovered.

**23SR997 - Late Archaic, Late Archaic-Woodland, Middle Woodland, Late Woodland**

This site is a lithic scatter in a cultivated field on the first terrace 300m west of the Osage River. After an intensive inspection of the site it was decided to sample using the transect method. Five transects were chosen and placed north to south across the site. Each transect had five collection units randomly positioned on it. In addition to the collection units, a number of individual artifacts were assigned proveniences. Flakes, chunks, cores, a biface, unifaces and hafted bifaces and a ground stone tool were found in an area 170m by 130m in size. This site is located on the edge of the reservoir.

A total of thirteen hafted bifaces were collected from the site and classified after Goldberg and Roper (1981). Five of the points were placed into damaged and undiagnostic Categories 999, 364, 362. The other specimens were categorized as follows: Two 325 (Rice Side-notched), a Middle and Late Woodland diagnostic, a Category 317 (Snyder), a Middle Woodland point, a Category 322 (Scallorn), a Late Woodland diagnostic, a Category 339 (Etley), associated with the Late Archaic and a Category 310, 311 (Cooper), associated with Late Archaic and Woodland components, (Goldberg and Roper 1981). Two additional specimens could not be placed in Goldberg and Roper's (1981) typology and were given additional numbers, Category 404, potentially diagnostic side-notched point and a Category 405, a side-notched bifurcate.

**23SR998 - Unidentified Prehistoric**

This site is a lithic scatter situated in agriculture lands 200m west of the Osage River. An intensive survey established the site size to be 50m by 30m, and noted that the number of flakes was less than thirty. It was decided to conduct a grab sample of the site. Flakes chunks, a biface and a uniface were collected. No diagnostic artifacts were encountered.

**23SR999 - Unidentified Prehistoric**

This site is a lithic scatter identified during a shovel test survey of an old field which is 20m north of an unnamed intermittent. Additional shovel tests, to establish site extent, were placed at 10m to 20m intervals around the first test to yield artifacts. A total of nine tests yielded materials. It was also possible to conduct a surface collection from an open area in the northern portion of the site. Flakes, cores, chunks and a biface were recovered from an area estimated to be 90m by 30m.

**23SR1000 - Unidentified Prehistoric**

This site is a lithic scatter found on a ridgenose which juts into the reservoir. The site was originally 30m west of the Osage River. Discovered during shovel testing of an old field, a series of shovel tests were placed in 10 to 20 meter intervals to establish the site boundaries. A total of five of these tests yielded flakes. It was also possible to conduct a surface collection on a portion of road to the south of the site, from which flakes were collected. Site size was estimated to be 150m by 60m. No diagnostics were found.

**23SR1001 - Early Archaic**

This site is a lithic scatter found in a cultivated field during a walkover survey. The site is situated on a slope above the Osage River, which flows 600m northwest. After an inspection of the site was performed to note artifact concentrations and site extent, the surveyors decided to sample with the transect method. One transect was run from north to south with three collection units on it. Additional plotted artifacts were also assigned proveniences. Flakes, chunks, cores, a biface, hafted bifaces and a uniface were recovered in ten surface proveniences. Site size is estimated to be 150m by 50m.

Two hafted bifaces were collected from this site and were categorized after Goldberg and Roper (1981). One specimen was too damaged to type accurately, the other represented Category 368. Both were considered to be diagnostic of the Early Archaic based on their similarity to points found at the Itasca Site (Shay 1971) by Goldberg and Roper (1981:21).

**23SR1002 - Unidentified Prehistoric**

This site is a lithic scatter located during shovel testing of an old field that is 30m west of Butler Hollow. A series of nine shovel tests were dug to establish site boundaries, only three of these were found to contain flakes. Surveyors were not able to conduct a surface collection due to the density of the ground cover. Site size was estimated to be 30m by 10m.

**23SR1003 - Unidentified Prehistoric**

This site is a lithic scatter discovered in a field located on the first terrace 60m east of Wright Creek. The extent of artifact distributions was established during an intensive inspection of the area, after which the surveyors sampled the site using the circular method. Four collection units were used to gather flakes, chunks and bifaces. Site size was estimated to be 20m by 20m.

**23SR1006 - Unidentified Prehistoric**

This site is an isolated find consisting of one biface. The site, presently in pasture, is on the floodplain of an intermittent stream which is 100m east of the site. The biface was discovered in an open area while shovel testing the pasture. None of the shovel tests contained cultural materials.

**23SR1007 - Unidentified Prehistoric**

This site is a lithic scatter discovered during shovel testing of a pasture which is on the first terrace of an intermittent stream lying 10m to the east. After one of the shovel tests was found to contain cultural material, the terrace was saturated with additional shovel tests. Flakes, chunks and a core were collected from four of the twelve shovel tests dug. Surface collection was not employed due to the density of ground cover. Site size was estimated to be 40m by 40m.

**23SR1008 - Unidentified Prehistoric**

This site is an isolated find located on a slope is 130m west of the Osage River. One flake was encountered during a walkover survey of agricultural land, and, after further search no additional artifacts were encountered.

**23SR1009 - Unidentified Prehistoric**

This site is a lithic scatter found on the first terrace of Monegaw Creek. The site is situated on an agricultural field which lies 100 meters to the southwest of the river. The collection chosen to sample this site was to be the circular strategy in conjunction with plotting individual artifacts not in collection units. Flakes, cores, chunks, bifaces, unifaces and hafted bifaces were collected on this site in a total of four collection units and eleven individually plotted artifacts. Site size was estimated to be 80m by 80m.

Of the three hafted bifaces found from this site, none were diagnostic. Only one fit into Goldberg's and Roper's Category 314, a potentially diagnostic, while the remaining two were designated in Category 364, for damaged corner-notched points (1981:65, 70).

**23SR1010 - Unidentified Prehistoric**

This site is a lithic scatter located on the first terrace of the Osage River approximately 100m north of the river. The site is between the floodplain and a steep slope which rises immediately north of the site. Twenty meters east is a small unnamed intermittent stream. An intensive inspection revealed this site to be quite extensive in size. It was therefore decided to sample the site with the circular method and to also collect those tools not falling into collection units. Six collection units and eight plotted proveniences were used to collect flakes, cores, chunks and unifaces. A large number of flaked cobbles were present. Site size was estimated to be 106m by 70m.

**23SR1011 - Early Archaic**

This site is a lithic scatter found on a slight rise on the first terrace of the Osage River. The site lies 40m northeast of a confluence of the Osage with a small intermittent stream. The site was extensively inspected, with artifact distribution and site boundaries defined. It was decided to collect the site with a transect sample. Two transects were laid out on the site with a total of eight collection units being employed. Individual artifacts were also collected in separate proveniences. Flakes, cores, chunks, bifaces, and hafted bifaces were recovered from the site. Site size was estimated to be 80m by 250m.

Of the two hafted bifaces found on this site only one was found to be diagnostic. Categorized after Goldberg and Roper (1981:44) one specimen was classified Category 362, a miscellaneous straight stemmed point, while the other was characteristic of Category 378 (Big Sandy) a type that has been noted within Early Archaic assemblages (Goldberg and Roper 1981:21).

### 23SR1012 - Unidentified Prehistoric

This site is a lithic scatter found on small knolls on the first terrace of the Osage River about 40m east of the river. The configuration of the site is L-shaped as it fits to the shape of the terrace. After an extensive inspection surveyors decided to use a linear strategy to collect the site. One transect was choosen to follow the shape of the site. Fifteen collection units were then randomly placed upon the transect, with five additional individual proveniences added. Flakes, cores, chunks, bifaces, unifaces and hafted bifaces were collected. Historic ceramics and glass, probably orienting from a house site, were noted but not collected. Site size was estimated to be 710m by 100m.

Three hafted bifaces were collected from this site. Two of these are categorized as 999 and 364, damaged and undiagnostic. The third specimen was not represented in any of the categories described in Goldberg and Roper (1981), therefore was assigned to Category 404, potentially diagnostic side-notched points.

### 23SR1013 - Unidentified Prehistoric

This site is a lithic scatter located on the floodplain of the Osage River in agricultural fields approximately 100m north of the river. The site was found to be a very small scatter. It was therefore collected in one general surface provenience. Flakes and bifaces were present on the site. Site size was estimated to be 46m by 10m.

### 23SR1014 - Unidentified Prehistoric

This site is an isolated find located on the second terrace of Monegaw Creek in an agricultural field 200 meters southwest of the Osage River. A single hafted biface was the only artifact found after an intensive survey of the area.

One hafted biface was found on this site. This specimen did not resemble any of the categories outlined in Goldberg and Roper (1981), it therefore was given the designation Category 407, a potentially diagnostic bifurcated base point.

### 23SR1015 - Late Archaic-Woodland

This site is a lithic scatter located on the first terrace of Monegaw Creek in an agricultural field 75 meters southwest of the creek. The site was found to have four areas of high artifact densities. Collection of the site was made by a general surface collection of each of the four concentrations. Flakes, cores, chunks, bifaces and hafted bifaces were collected in the four loci. Site size was estimated to be 200m by 150m.

The hafted bifaces were recovered from this site, all were classified after Goldberg and Roper (1981). It was found that one of the three points was an unidentified corner-notched, Category 364. A second point resembled Category 310, 311 (Cooper varients) a type associated with Late Archaic and Woodland assemblages. The last specimen was designated Category 407, potentially diagnostic bifurcate.

**23SR1016 - Early Archaic, Late Archaic**

This site is a lithic scatter located on the first terrace of Baker Branch. The site is situated 70m southwest of the confluence of Baker Branch and an unnamed intermittent stream. The site was located during a walkover of cultivated agricultural fields. It was determined, after the site's boundaries were delineated, that the site was extensive enough in artifactual distribution and size to warrant a transect sample. One transect, with two collection units, was oriented east to west across the site. Flakes, cores, chunks, and hafted bifaces were collected. Site size was estimated to be 100m by 80m.

Two hafted bifaces were collected from this site and classified after Goldberg and Roper (1981). They were found to be representative of Category 355, a Late Archaic point type, and Category 354 (Rice Lobed) an artifact found in Early Archaic assemblages (Goldberg and Roper 1981:58).

**23SR1017 - Unidentified Prehistoric**

The site is an isolated find of a biface fragment found during an inspection of open ground. The site, situated on a farm equipment trail, is on the first terrace adjacent to an unnamed intermittent stream, which flows to the northwest of the site.

**23SR1018 - Unidentified Prehistoric**

This site is a lithic scatter found on a knoll on the floodplain of Baker Branch. The site is situated approximately 20m north of the branch. This area, presently under cultivation, was included in a walkover survey. After the site was found, the boundaries of the scatter were determined. During this activity, it was noted that the artifact scatter was very sparse relative to the size of the site, approximately 50m by 74m. For this reason, a total surface collection was conducted. Flakes, chunks, cores, a hafted biface, a biface and unifaces were recovered.

A single hafted biface was recovered from this site, and was subsequently classified after Goldberg and Roper (1981). This particular form was not represented in Goldberg's and Roper's typology, it was therefore assigned to Category 409, miscellaneous Lanceolates.

**23SR1019 - Unidentified Prehistoric**

This site is a lithic scatter on a knoll on the floodplain of Baker Branch about 20m north of the creek. It is approximately 100m west of SR1018. Intensive inspection showed the site to be a sparse scatter, best collected by means of one provenience. Flakes were the only artifact class represented at this site. Site size is estimated to be 20m by 10m.

**23SR1020 - Unidentified Prehistoric**

This site is a lithic scatter found on a slope above Baker Branch. The site is situated about 100m to the north of the Branch. Intensive investigation of the site, which lies in a plowed agricultural field, revealed that it was a relatively small and

sparse scatter. Surveyors therefore decided to conduct a total surface collection of the site. Flakes and chunks were the only artifacts present. Site size was estimated to be 25m by 25m.

**23SR1021 - Early Archaic**

This site is a lithic scatter on a terrace and a slope among three springs. The site is approximately 300m north of Clear Creek. The site was inspected and found to be a large scatter with three well defined concentrations. The larger concentration was located in the northern and eastern portions of the site, on ground that was significantly higher than the rest of the terrace to the south. This portion of the site was sampled using two transects and five collection units were situated randomly on each of the transects. Individual artifacts were also plotted and collected. The second concentration was to the west in a low area associated with a spring. This portion was collected as one general surface provenience. The final concentration was located on the terrace and terrace slope above the springs. This area, on the southern boundary, was also collected in one general surface provenience. Flakes, cores, chunks, unifaces, bifaces and hafted bifaces were all recovered in twenty-one proveniences. Site size was estimated to be 270m by 65m.

Two hafted bifaces have been collected from this site. Both were classified after Goldberg and Roper (1981). One was classified as a Category 350, a Dalton point, while the other did not fit into any of Golberg's and Roper's categories. This specimen was categorized as a potentially diagnostic basal notched point (Category 402).

**23SR1022 - Unidentified Prehistoric**

This site is a lithic scatter located on a slope between the floodplain and first terrace of Clear Creek near an old meander channel which is about 50m east of the site. Presently, the creek is 400m south. After an intensive inspection of the site, it was decided to use a transect sampling strategy. One transect, oriented along the north-to-south axis of the site, was laid out with two collection units. Three other individual artifacts were also given proveniences. Flakes, cores, chunks, a biface and unifaces were recovered. Site size was estimated to be 60m by 20m.

**23SR1023 - Late Archaic**

This site is a lithic scatter found on the edge of the first terrace of Clear Creek. The site is 50m west of the creek. Following an intensive inspection of the agricultural lands on which the site lies, it was decided to do a total surface collection of the site. The site was divided into two loci and an additional number of individual artifacts were plotted on the site map and collected. Flakes, cores, chunks, a hafted biface and unifaces were recovered in a total of ten surface proveniences. Site size was estimated to be 90m by 35m.

One Afton projectile point was found at this site. These are generally thought to be diagnostic of the Late Archaic period in this area (Kay 1978:61; Purrington 1971). Goldberg and Roper note that this placement is not definitive, due to the presence of three Afton points at 23HI297 in stratigraphic context below a Late Woodland component but above a Late Archaic component containing Sedalia

Etley, and Smith points and a thermoluminescence date of 425 ± 250 B.C. They suggest a date of A.D. 20 ± 200 based on thermoluminescence dating of materials in the same level (1981:41-42).

**23SR1024 - Late Archaic-Woodland**

This site is a lithic scatter on the edge of the first terrace above a remnant of the old stream channel of Clear Creek. The old channel, now almost totally silted in, is a very noticeable feature on the landscape. Clear Creek is presently 150m east of the site. The land upon which the site is situated is under cultivation. It was decided after an inspection of the site that a transect sample should be employed. One continuous transect was created that followed the edge of the terrace. Fifteen collection units were then placed randomly along the transect. These units along with six other proveniences, assigned to individual artifacts, were used to collect flakes, cores, chunks, hafted bifaces, bifaces and unifaces. Site size was estimated to be 715m by 30m.

Two Standlee projectile points were found at this site. These have been found in stratigraphic context at the Cootie Site (23BE676) continously distributed from the Late Archaic to the Late Woodland, although they were more frequent in the Late Archaic (Goldberg and Roper 1981:47).

**23SR1025 - Early Archaic, Late Archaic-Woodland, Middle Woodland, Late Woodland**

This site is a lithic scatter on a slope above Horseshoe Lake, an oxbow lake present in a former channel of the Osage River, and is approximately 50m west of the lake bank. The site was inspected and found to have a large number of artifacts, with two areas of major concentrations. While the whole site was sampled using the transect strategy, these concentrations were given more emphasis. Three transects were chosen that started near the smaller of the two concentrations on the southern border of the site. All transects were oriented parallel to the land form. A number of individual artifacts were also piece plotted on the map. One last locus was located across an intermittent stream which separated it from the rest of the site. This locus was collected as a general surface provenience. Flakes, cores, chunks, bifaces, hafted bifaces and unifaces were collected in a total seventy-eight proveniences. Site size was estimated to be 130m by 600m. Nine collection units were placed randomly along each transect.

A total of nine hafted bifaces were recovered and classified after Goldberg and Roper (1981). Of these nine, two fit into Category 307 (Afton, Late Archaic), two into Categories, 302 and 306, attributed to Late Archaic and Woodland periods; one Category 317 (Snyders) a Middle Woodland type; and a single Category 325 (Rice Side-notched), a Middle and Late Woodland point. Two hafted bifaces did not fit into Goldberg's and Roper's typology; they were designated as Category 400, a corner-notched potentially diagnostic, and Category 410, a Rice lanceolate. One specimen was found to be a Category 364, unidentifiable corner-notched.

**23SR1026 - Unidentified Prehistoric**

This site is a lithic scatter on a slope between the first and second terraces above Horseshoe Lake, an oxbow lake in the old meander channel of the Osage River. The site is situated 60m southwest of the lake and was initially found during a walkover survey of agricultural field. After determining the site's boundaries, it was decided to collect all materials in one general surface provenience. Flakes and chunks were the only artifact classes found. Site size is estimated to be 15m by 20m.

**23SR1027 - Unidentified Prehistoric**

This site is a lithic scatter on the first terrace above Clear Creek, about 300m west of the creek on the edge of an old meander channel of the Osage River. The site, which is presently in cultivation, was found to be small with a sparse scatter of artifacts. For this reason, the site was collected in one general surface provenience. Flakes, cores and a biface were recovered from the site. Site size was estimated to be 50m by 30m.

**23SR1028 - Unidentified Prehistoric**

This site is a lithic scatter on the first terrace of Little Clear Creek. The site, 100m north of the creek in an agricultural field, was found to be a sparse scatter distributed over a small area. It was decided to collect this site in one general surface provenience. Flakes were the only artifact class encountered at this site. Site size was estimated to be 10m by 50m.

**23SR1029 - Unidentified Prehistoric**

This site is a lithic scatter on the first terrace of Little Clear Creek, about 55m north of the creek. The site was initially found during a walkover survey. After determination of site boundaries, it was decided to place four transects oriented northeast to southwest, each with four collection units. A number of individually plotted artifacts were also given proveniences. Flakes, cores, chunks, bifaces and unifaces were collected in a total of nineteen collection units. Site size was estimated to be 200m by 100m. A single hafted biface was collected but proved to be too damaged to be typed after Goldberg and Roper (1981).

**23SR1030 - Early Archaic**

This site is a lithic scatter situated on a levee above the Osage River. The site is in an agriculture field, approximately 15m to the east of the river. An intensive inspection of the site revealed it to be a sparse and small scatter. One surface provenience was used to collect the site. Flakes, chunks and a biface were collected. Site size was estimated to be 90m by 30m. No diagnostic artifacts were encountered.

A single hafted biface was found on this site and classified after Goldberg and Roper (1981:20-21). This specimen was found to fit into Category 368, a type assigned to the Early Archaic.

**23SR1031 - Unidentified Prehistoric**

This site is a lithic scatter located on the second terrace above the Osage River. The site is situated approximately 50 meters to the west of the river, in agricultural land found during an initial walkover, the site was more intensively inspected and determined to be small enough to collect totally. The site was divided into two loci: flakes, chunks and a biface were recovered. Site size was estimated to be 135m by 80m.

**23SR1032 - Late Archaic-Woodland**

This site is a lithic scatter on the first terrace of the Osage River approximately 100m west of the river in agricultural lands. Intensive survey of the area determined site boundaries and it was decided to collect the site using the linear sampling strategy. One transect was placed across the site with three collection units randomly distributed along its length. Flakes, cores, chunks, bifaces, and a hafted biface were all collected from the field. Site size was estimated to be 170m by 35m.

One hafted biface was collected and classified after Goldberg and Roper (1981:35-37). This specimen was categorized as a 327, 328, (Truman Broad Blade), attributed to the Late Archaic and Woodland periods.

**23SR1033 - Unidentified Prehistoric**

This site is a lithic scatter on the edge of the reservoir in the Big Muddy Creek area. The site is an old field. An intensive survey was undertaken, and the site was found to be a sparse lithic scatter limited to an area 40m by 30m in size. Surveyors conducted a grab sample which recovered flakes, cores, chunks, bifaces and an uniface. No diagnostics were encountered.

**23SR1034 - Unidentified Prehistoric**

This site is a lithic scatter found during a walkover of an old field 100m to the north of the original channel of Little Muddy Creek. The site is now on the shoreline of the reservoir. A lack of substantial ground cover facilitated the intensive survey to determine site size and artifact concentrations. It was found that less than thirty flakes were present in an area estimated to be 40m by 20m. A total surface collection was employed, which recovered flakes, chunks and a uniface.

**23SR1035 - Unidentified Prehistoric**

This site is a lithic scatter found during a walkover survey in a plowed field on the first terrace 20m west of Little Muddy Creek. The site was inspected for artifact content and extent, after which it was decided to employ the transect method to sample the site. Two transects were chosen and laid out, each with four collection units located on them. Flakes, cores, chunks and bifaces were collected from the site. Site size is estimated to be 210m by 60m.

**23SR1036 - Late Archaic-Woodland**

This site is a lithic scatter located on the first terrace approximately 30m south of Weaubleau Creek. It was decided after a more intensive inspection of the site to determine size and area of concentrations, that the site would be broken up into ten loci. Each of these loci corresponded to a concentration, and each was picked up in a total surface collection. These concentrations were often located on small knolls on the terrace. Flakes, cores, chunks, bifaces and hafted bifaces were recovered. Site size was estimated to be 110m by 400m.

A total of nine hafted bifaces were recovered from this site. All points were classified after the typology described in Goldberg and Roper (1981). This site seems to have a strong Woodland component, as is evident in the Woodland diagnostics found: Two Category 325 (Rice Side-Notched), a Category 343 (Waubesa) and a Category 310,311 (Cooper variants, also associated with Late Archaic assemblages). Two unidentified fragments (Category 999) were also present.

**23SR1037 - Unidentified Prehistoric**

This site is a lithic scatter found on the first terrace 30m north of Weaubleau Creek. The site, found during a walkover survey of a plowed field, was given an intensive inspection to determine site boundaries and artifact densities. It was decided to divide the site into grid of six equal 80m by 40m loci. Loci 4 was dividied into two units, each reflecting a concentration. A total surface collection was conducted for all loci. Flakes, cores, chunks, bifaces and unifaces were collected. Site size was estimated to be 240m by 80m.

**23SR1038 - Unidentified Prehistoric**

This site is a lithic scatter on the first terrace of Monegaw Creek approximately 60m south of the creek. Found during a walkover of plowed fields, the site was subsequently intensively inspected. This indicated that the site was a low density scatter. For this reason, a total surface collection was employed. Flakes were the only type of artifact found. Site size was estimated to be 20m by 20m.

**23SR1039 - Unidentified Prehistoric**

This site is a lithic scatter on the edge of the first terrace of Monegaw Creek, approximately 300m west of the creek. An intensive inspection of the site to determine site boundaries revealed that the site was of low density. Flakes, chunks and a biface were collected in one surface collection provenience. Site size was estimated to be 50m by 20m. No diagnostic artifacts were found.

**23SR1040 - Early Archaic**

This site is a lithic scatter on the first terrace of Monegaw Creek about 40m north of the creek. An intensive inspection of the site was conducted to determine site boundaries. From this, it was determined that the artifact scatter was sparse. As a result, a total surface collection was done. Flakes and a hafted biface were collected. Site size was estimated to be 40m by 20m.

A single hafted biface was collected from this site. This specimen was classified as a Riced Lobed, Category 354, an Early Archaic diagnostic (Goldberg and Roper 1981:57).

**23SR1041 - Unidentified Prehistoric**

This site is a lithic scatter on the first terrace of the Osage River. The site is 150 meters north of the river in agricultural land. Close inspection of the site showed that the use of a circular strategy would be warranted to sample the site. A total of four collection units were located, with two additional proveniences being assigned to individual tools. Flakes, cores, bifaces and chunks were recovered from the site. Site size is estimated to be 150m by 150m.

**23SR1042 - Unidentified Prehistoric**

This site is a lithic scatter located on a slope 100m north of a small intermittent stream. An intensive survey was conducted to establish site boundaries and locate the presence of concentrations and tools. Surveyors discovered that the scatter was very light and distributed in an area measuring 50m by 100m. It was decided to collect the whole site in one general surface provenience. Flakes, chunks, and a biface were recovered.

**Vernon County (VE)**

**23VE129 - Unidentified Prehistoric**

This site is a lithic scatter on the floodplain of the Marmaton River. The site is in agricultural land 175m east of the river. An intensive inspection of the vicinity was conducted. The site was ascertained to be a light scatter, best collected in one surface provenience. Flakes were the only artifacts found on the site. Site size is estimated to be 30m by 15m.

**23VE130 - Unidentified Prehistoric**

This site is an isolated find discovered while doing a walkover survey of the floodplain of the Marmaton River. The site is situated 200m to the south of the river. After the initial discovery of a uniface, an intensive inspection of agricultural land in the vicinity was conducted. No additional artifacts were recovered.

**23VE131 - Unidentified Prehistoric**

This site is an isolated find discovered during a walkover survey of harvested agricultural land. The site is situated 25m to the north of Bee Branch on the floodplain. After the initial discovery of a core, an intensive survey was conducted. No additional cultural materials were found.

**23VE132 - Unidentified Prehistoric**

This site is a lithic scatter found on the floodplain of Bee Branch about 100m east of the branch. The site was initially discovered during a walkover of harvested

agricultural lands. An intensive inspection of the site resulted in a total surface collection of the site being conducted. Flakes were the only artifact class present. Site size is estimated to be 30m by 20m.

## DISCUSSION OF SITE ATTRIBUTES

In this section, summary data concerning the various attributes of sites will be presented. These data can be divided into two major categories: those focused on settlement pattern analysis, and those focused on management needs. The variables and attributes to be discussed for the settlement pattern analysis included site size, landform, slope, stream rank, type of water source, and distance to water. Observations made concerning management needs include type of collection made, type of vegetation, amount of ground cover, number of surveyors, and time spend collecting. The balance of this section will be a presentation of the cultural affiliations for the sites.

The locations of the sites located during this survey are presented in Figures 15-19. These locations are schematic and the maps are of a sufficently large scale so that exact site locations cannot be determined.

### Site Size

This variable is a very important one because it figures both in the analysis of settlement patterns and in the development of recommendations for the management of resources by providing an initial estimate of relative costs of additional testing or mitigation, should either of these be deemed necessary.

In the field, during the recording of the site, size was the first thing determined. In sites discovered by means of shovel testing, the field strategy was designed to obtain an estimate of site size by employing a "two steps forward -one step back" method of shovel testing. This called for placing shovel tests approximately ten meters apart and maintaining this interval as long as cultural materials continued to be found. When a test was not successful, the surveyor retreated halfway back to the last successful test. If this test were successful, then the process continued. If it were not, then the last successful test was considered to be the site boundary. The estimation of site size by shovel testing is very difficult because it is so dependent on artifact density, a variable that is independent of site size. The small volume of soil that is examined during the course of a single shovel test usually means that the density of artifacts must be quite high in order for there to be a reasonable chance to encounter artifacts.

Table D-9 displays the frequency distribution of site sizes for sites recorded during the present survey. As can be seen, 39.4 percent of the sites occupy an area less than 35 meters by 35 meters in size. On the other hand, 30.0 percent of the sites can be considered to be large - greater than 50 meters by 100 meters in size. Examining this table, it is apparent that site sizes are evenly distributed throughout the aggregates, which may indicate that the measurement of site sizes is largely accurate. For example, 13 sites of Size Rank 1 were found in Aggregate 8, where only cultivated fields were inspected. This is 33 percent of the total recorded for the aggregate. This proportion compares favorably with the number

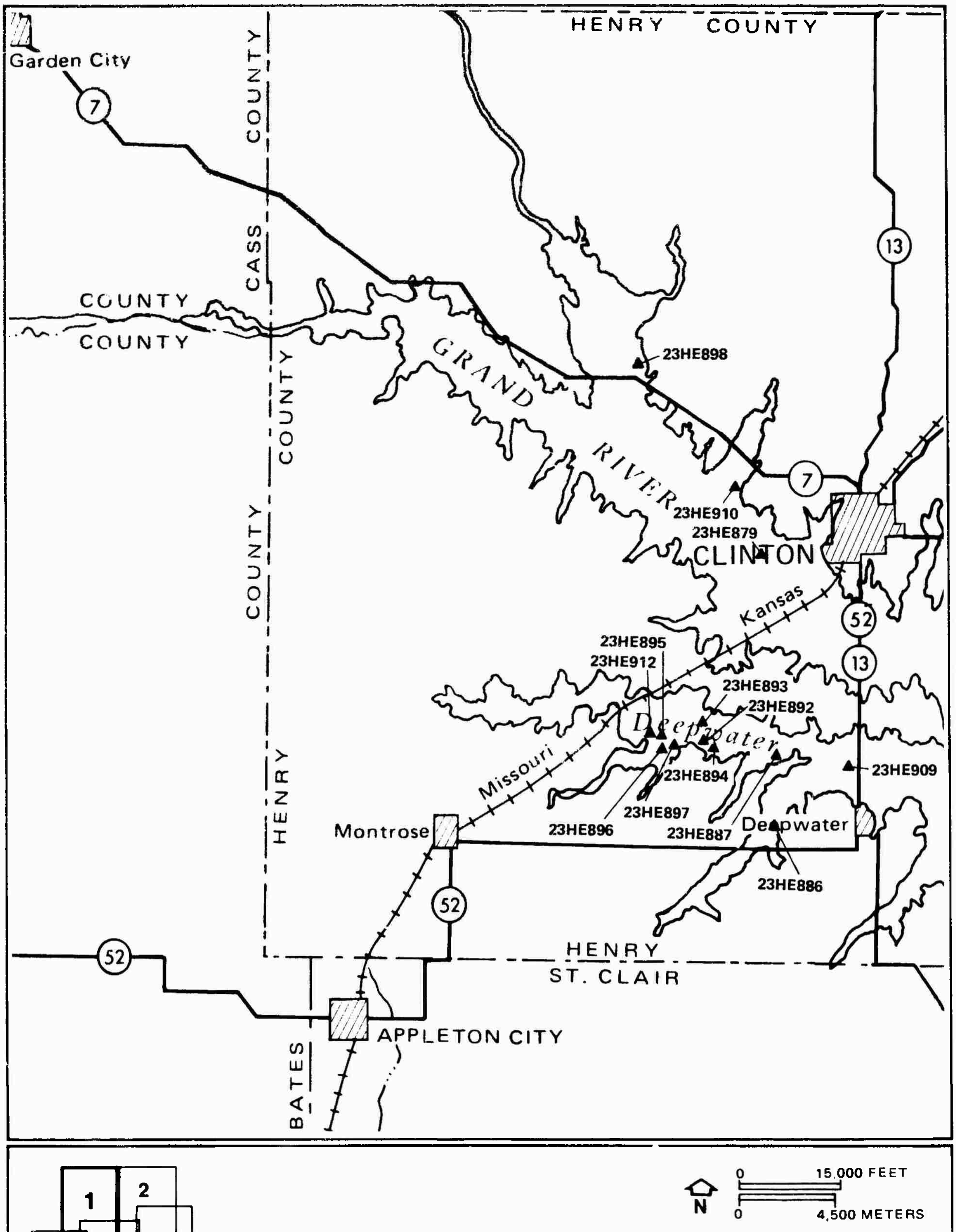


FIGURE 15
**ARCHEOLOGICAL SITE LOCATIONS**
**STRATA 20-21-23**

HARRY S. TRUMAN RESERVOIR – OSAGE RIVER BASIN
U.S. ARMY ENGINEER DISTRICT – KANSAS CITY, MISSOURI

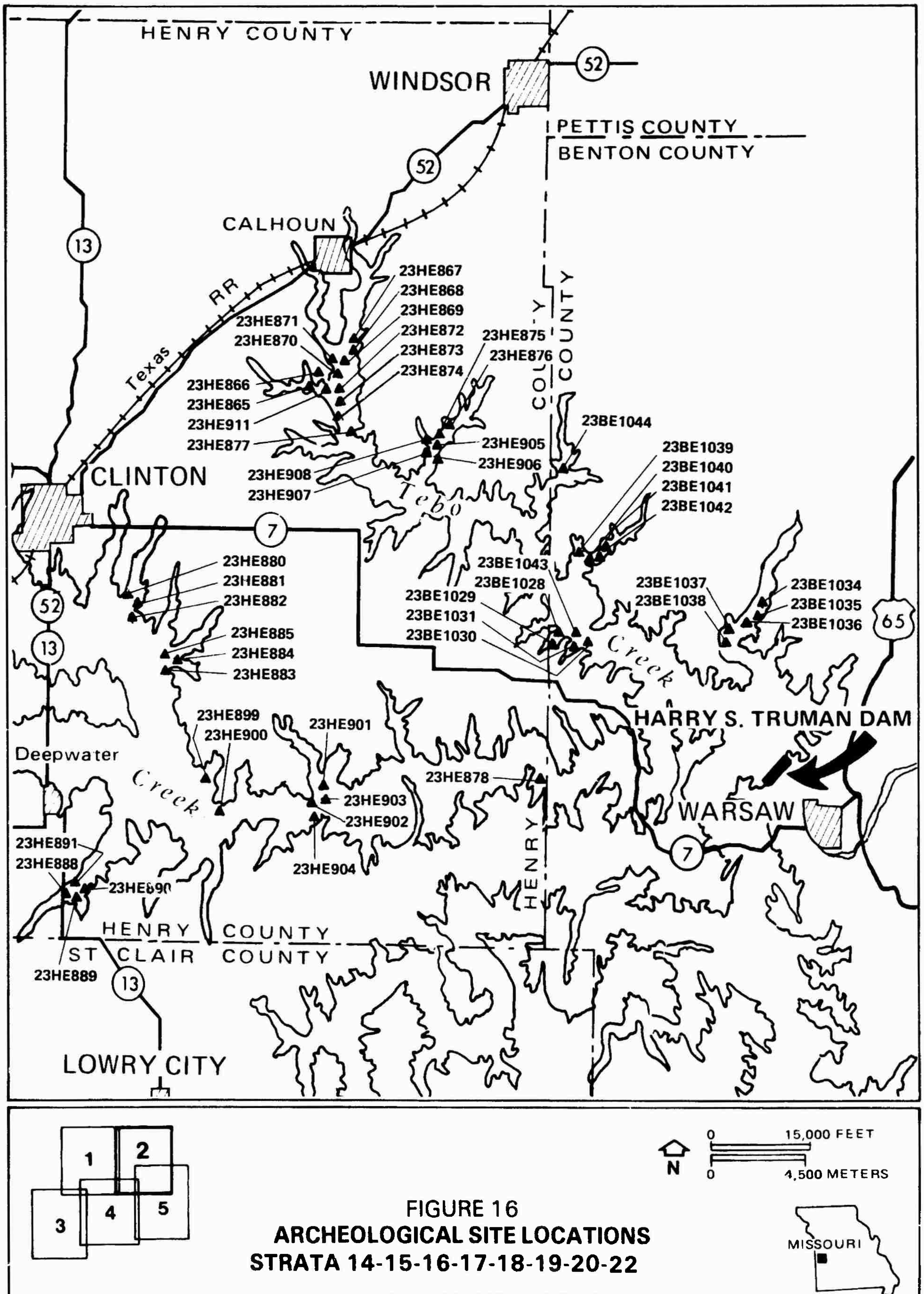


FIGURE 16
**ARCHEOLOGICAL SITE LOCATIONS**
**STRATA 14-15-16-17-18-19-20-22**

HARRY S. TRUMAN RESERVOIR — OSAGE RIVER BASIN
U.S. ARMY ENGINEER DISTRICT — KANSAS CITY, MISSOURI

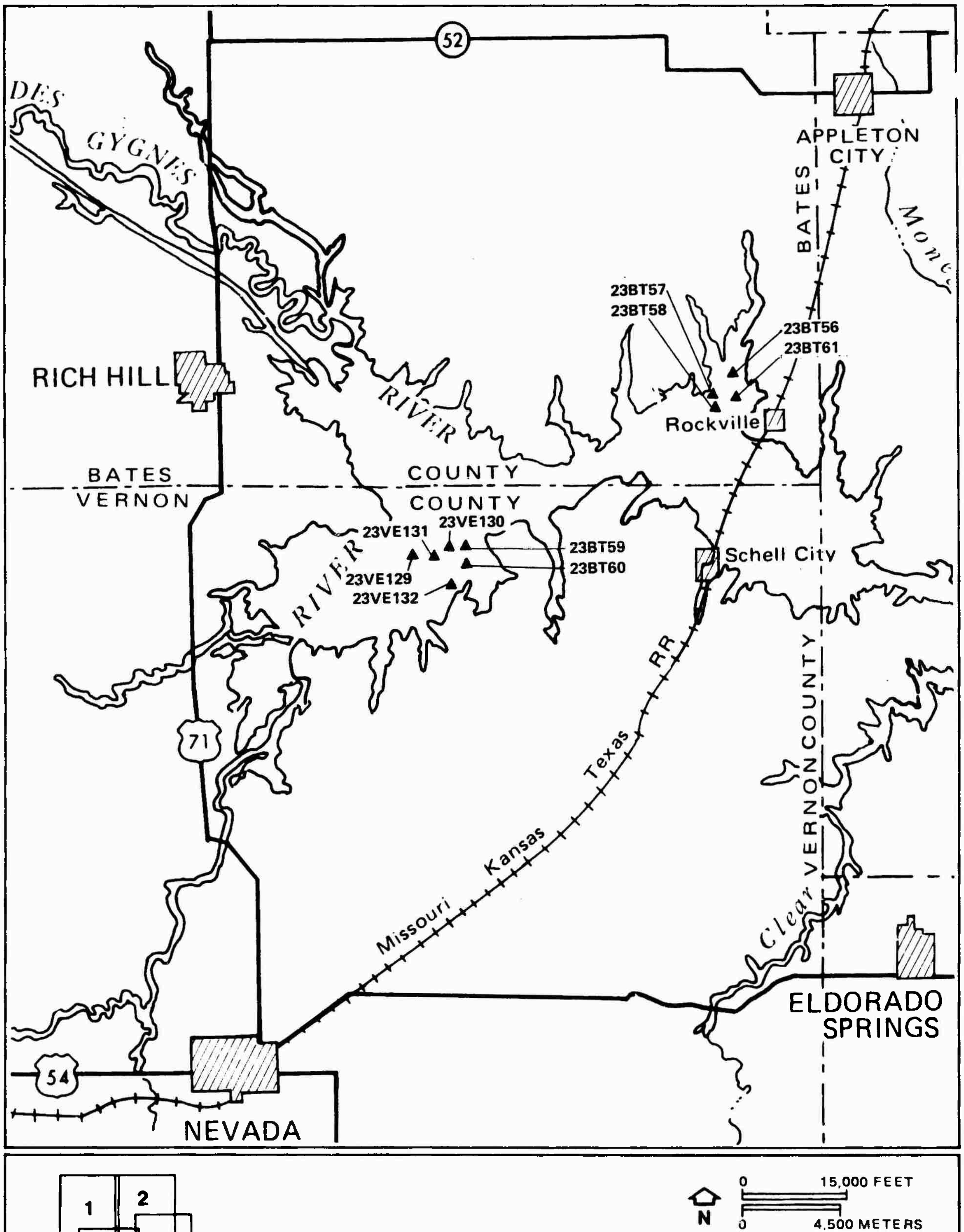


FIGURE 17
**ARCHEOLOGICAL SITE LOCATIONS**
**STRATUM 24**

HARRY S. TRUMAN RESERVOIR – OSAGE RIVER BASIN
U.S. ARMY ENGINEER DISTRICT – KANSAS CITY, MISSOURI

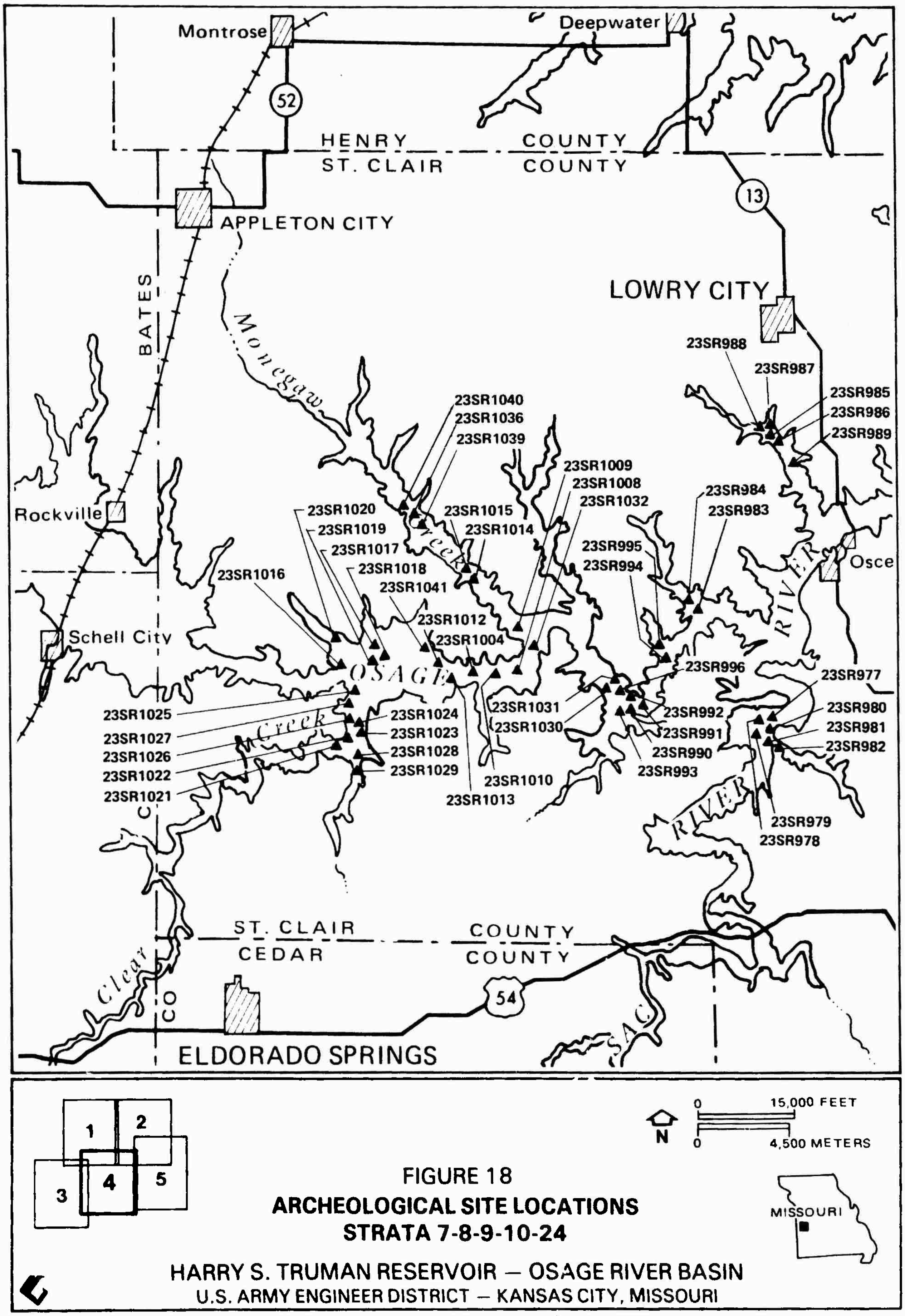


FIGURE 18
**ARCHEOLOGICAL SITE LOCATIONS**
**STRATA 7-8-9-10-24**

HARRY S. TRUMAN RESERVOIR — OSAGE RIVER BASIN
U.S. ARMY ENGINEER DISTRICT — KANSAS CITY, MISSOURI

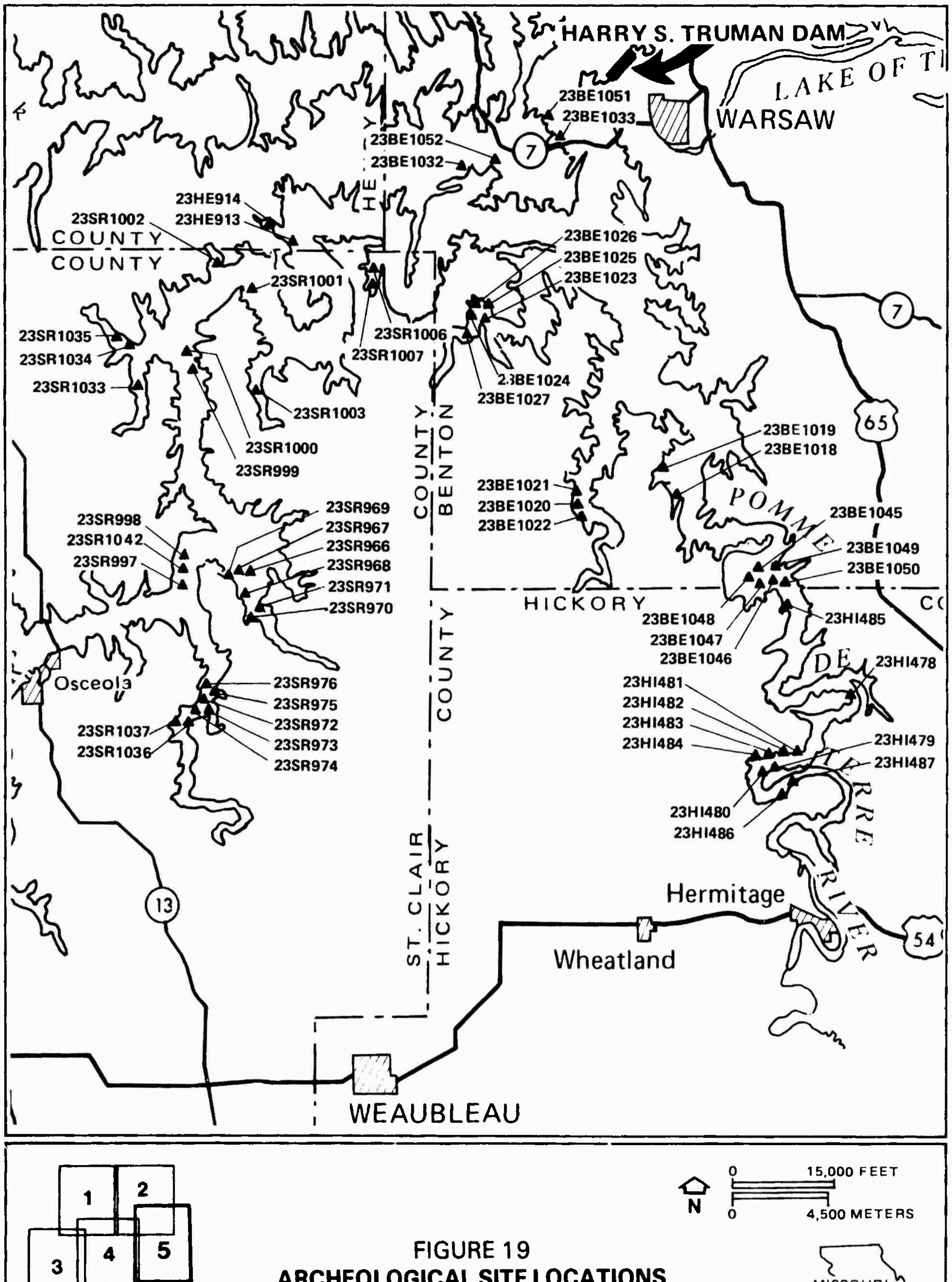


FIGURE 19
**ARCHEOLOGICAL SITE LOCATIONS**
**STRATA 1-2-3-4-5-6-11-12-13**

HARRY S. TRUMAN RESERVOIR — OSAGE RIVER BASIN
U.S. ARMY ENGINEER DISTRICT — KANSAS CITY, MISSOURI

recorded for Aggregate 3, where 8 of 33 sites were Size Rank 1. The complete range of groundcover situations was encountered in this aggregate.

Table D-10 displays mean site sizes by aggregate total and also indicates those sites which were surface collected and those discovered by means of shovel testing. As would be expected, there are substantial differences in site size, with surface collected sites being roughly four times larger than shovel tested. This does not necessarily mean that shovel-testing results in site size being underestimated. The frequency distribution of site sizes for shovel-tested sites is displayed in Table D-11. This shows that all size ranks except the largest are represented. Furthermore, the proportional representation of the first four size ranks is roughly equal to their representation in the total sample of sites.

### Landform

Four landform categories were recognized during the recording of sites. These are T-O, or active floodplain; T-1, or the first terrace above T-0; T-2, or the second terrace, and slope, which represents all surfaces not of alluvial origin. Table D-12 displays the frequency distribution of landform categories. As would be expected, given the location of the study area, 72.2 percent of the sites were located on alluvial surfaces. 45.0 percent of the sites were located on the first terrace, which is also expected. It is not possible to compare these results with the results of the Stage I and Stage II surveys because this information is not discussed. The distribution of sites on landforms is fairly regular across the various aggregates with the possible exception of aggregates 7 and 8, which are located in the easement lands. In these cases, the large number of sites on the first terrace is likely due to the fact that cultivated fields were surveyed and these are most often located on that landform.

### Slope

This variable measures the levelness of site surfaces and was observed for each site recorded. As Table D-13 shows, 55.6 percent of the sites are located on 0 to 1 percent slopes, which would be expected given that most of the sites are located on terraces. These results cannot be compared with the Stage I and Stage II surveys because this information was not presented.

### Stream Rank

The rank of the nearest stream was recorded for each site. These results are displayed in Table D-14. It should be noted that there is one small difference between this survey and the Stage I and Stage II surveys. The south grand has been assigned a rank of 9 for this survey rather than the 10 assigned by Roper (1977:194). Comparing these results with the results of Stage II (Roper 1977: Table 24) shows that there are major differences in the first five ranks. The present survey located 20.6 percent of its sites on Rank 1 or Rank 2 streams while the Stage II survey located 37.8 percent there. Conversely, 52.8 percent of the sites were located along Ranks 3, 4, or 5 streams while only 32.4 percent of the Stage II sites were so located. While it cannot be substantiated, the differences in these results are probably due to the differences in the placement of the respective survey areas. Stage II, it will be recalled was a 10 percent stratified random transect sample of

all the fee lands, while the present survey was restricted to the lands between 706 feet and 731 feet above sea level. This has resulted in the present survey inspecting lands near the major rivers such as the Osage and the South Grand. In this zone, the frequency of Rank 3, 4, and 5 streams is higher. The frequency of sites located on Rank 9 and Rank 10 streams is roughly the same for both surveys (29.8 percent for Stage II, 26.7 percent for this survey).

### Type of Water Source

The type of water source nearest the site was recorded for each site. These results are displayed in Table D-15. Intermittent streams are those with periodic flow. Perennial streams are those with water flowing year-round. "River" refers to the Osage, Pomme de Terre, South Grand, and the Sac. Confluence notes that the site is located at the juncture at two streams. "Natural lake" is self-explanatory and refers principally to oxbow lakes. "Swamp" or "bog" is also self-explanatory. "Slough" refers to an oxbow lake that is mostly filled in. "Spring" refers to a place where water discharges from the ground.

### Distance to Water

This variable is the distance of the site to the nearest water source. These results are displayed in Table D-16. As would be expected, 73.3 percent of the sites are within 150 meters of water. In the Stage II survey, 82.4 percent of the sites were within .1 mile (Roper 1977: Table 23), so these results compare favorably.

### Survey Conditions

In this section, various aspects of the survey methodology will be discussed. Data will be presented for the type of collection made at each site, the type of vegetation found at the site, the amount of groundcover, number of surveyors, and time spent collecting a site.

### Type of Collection

The original research design proposed three major strategies for collecting sites. These were the linear collection method, the circular collection method, and shovel testing. Their use on a site was to be dependent largely on the shape of the artifact scatter or on the presence of extensive groundcover effectively preventing surface collection (Taylor 1980). This had to be modified in the field due to the occurrence of conditions not anticipated by the research design. In general, the modifications were made to cope with the collection of low density artifact scatters, a situation in which the use of the two proposed methods would result in the collection of few, if any, artifacts. The modifications included the addition of two categories, general surface and multiple loci collections. General surface collections refer to the collection of artifacts in one provenience. This was almost exclusively employed in low artifact density situation. The multiple loci collection method was to collect sites where artifact density was low but artifacts were clumped in minor hotspots. If these sites were randomly sampled, it would have very likely that few artifacts would have been collected.

Table D-17 display the results of the type of collections employed during this survey. It is apparent that the modifications mentioned above were necessary, because 40.6 percent of the sites were collected by means of a general surface collection. Conversely, only 42.8 percent of the sites were collected according to the research design.

### Type of Vegetation

A number of different vegetation categories were recognized during the recording of sites. These include pasture, forest, and old field. These are self-explanatory. A distinction was made between plowed and cultivated fields, with the latter referring to the presence of crops. Homesite is the last category used, but this occurred only twice. Table D-18 display the results of this attribute.

### Amount of Groundcover

The amount of groundcover on a site surface was recorded for each site. This was done on a percentage basis with zero indicating open ground. As can be seen, the majority of the sites recorded were in settings with less than 20 percent groundcover. Cultivated fields, it should be noted, were not all considered to be surfaces with good visibility. Each cultivated field was evaluated separately. Figures 20 and 21 show the range of cover conditions that occur on cultivated fields. Table D-19 display the results for this attribute.

### Number of Surveyors

The number of surveyors was recorded for each site. The most frequent modes were 2 (42.8 percent) and 4 (35.6 percent) surveyors. These results are displayed in Table D-20.

### Time Spent Collecting

The time spent collecting per surveyor was recorded for each site. This was done largely to permit an estimate of labor cost for collecting sites. These results are displayed in Table D-21.

### Cultural Affiliations

In this section, the cultural affiliations that have been assigned to the various sites will be presented. Table D-22 presents the assignment of cultural affiliations by aggregate. This table was compiled by assigning a site to a cultural period, each represented by a diagnostic projectile. Thus, a site with one projectile point such as a Rice Side-notched will have a Late Archaic and a Woodland affiliation assigned. This has resulted in more components than sites, especially in Aggregate 1 where Site 23 HI 484 has many diagnostic artifacts of this time range.

Figures 22, 23, 24 and 25 present the information about cultural affiliation graphically. Here, they are divided into Dalton-Early-Middle Archaic (Figure 22); Late Archaic only (Figure 23); Late Archaic - Woodland (Figure 24), and Woodland - Mississippian (Figure 25). This was done in order to separate the known Archaic

A. Variations in ground cover (0 to 20%) in cultivated field.

B. Variations in ground cover (40%) in cultivated field.

FIGURE 20
**LOCATION PHOTOGRAPHS**

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A. Variations in ground cover (60%) in cultivated field.

B. Variations in ground cover (80%) in cultivated field.

FIGURE 21
**LOCATION PHOTOGRAPHS**
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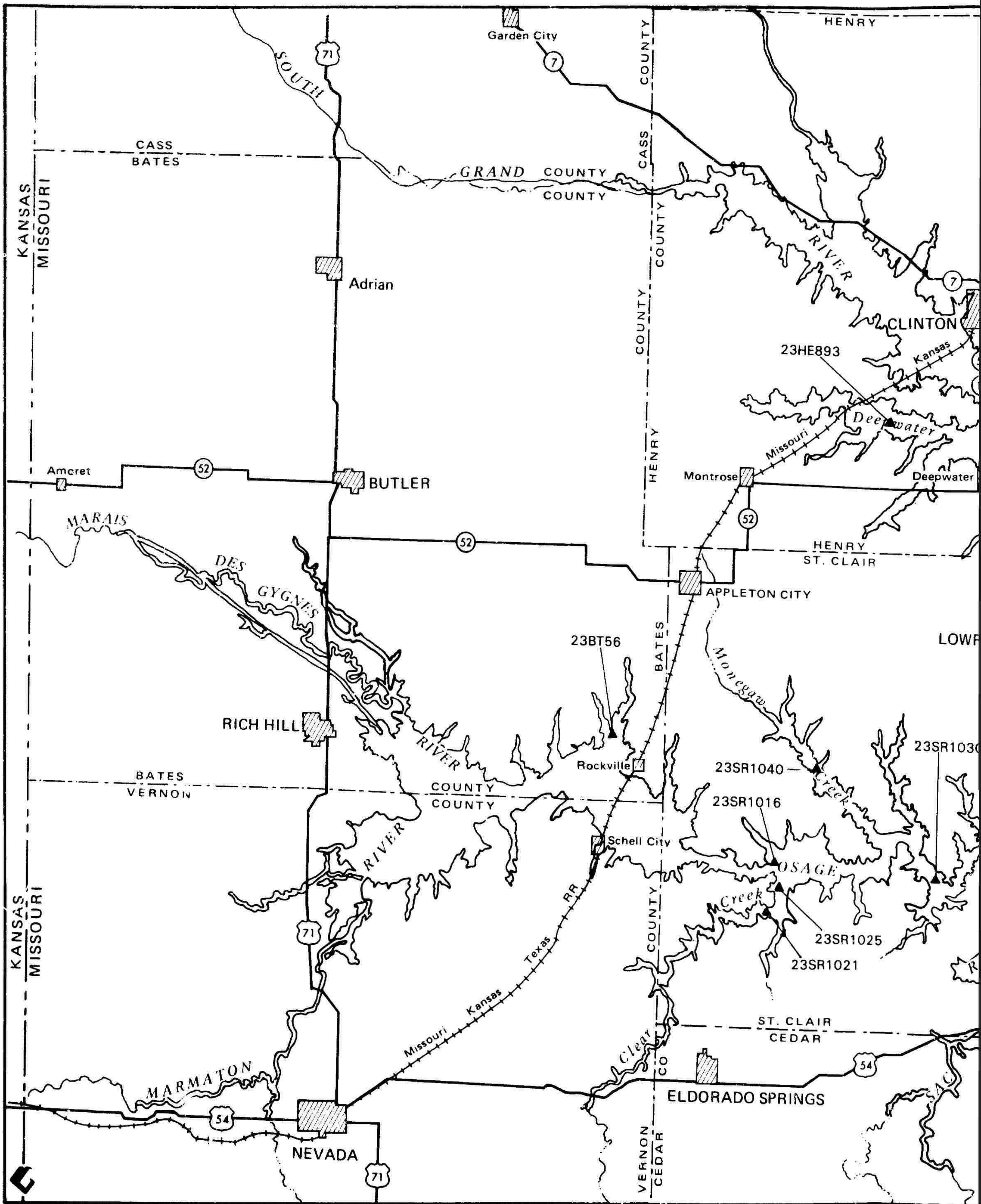
U.S. ARMY ENGINEER DISTRICT – KANSAS CITY, MISSOURI



HENRY
Garden City
7
71
SOUTH
CASS COUNTY
CASS
BATES
GRAND
COUNTY
COUNTY
KANSAS
MISSOURI
RIVER
HENRY COUNTY
Adrian
CLINTON
23HE893
Kansas
Deepwater
Missouri
Amoret
52
BUTLER
Montrose
Deepwater
MARAIS
DES
GYGNES
HENRY
ST. CLAIR
APPLETON CITY
23BT56
BATES
Monegaw
LOWR
RICH HILL
RIVER
Rockville
23SR1040
Creek
23SR1030
BATES
VERNON
COUNTY
COUNTY
23SR1016
Schell City
RIVER
OSAGE
Creek
23SR1025
23SR1021
KANSAS
MISSOURI
RR
Texas
Kansas
Missouri
ST. CLAIR
CEDAR
Clear
CO
ELDORADO SPRINGS
54
MARMATON
NEVADA
VERNON
CEDAR

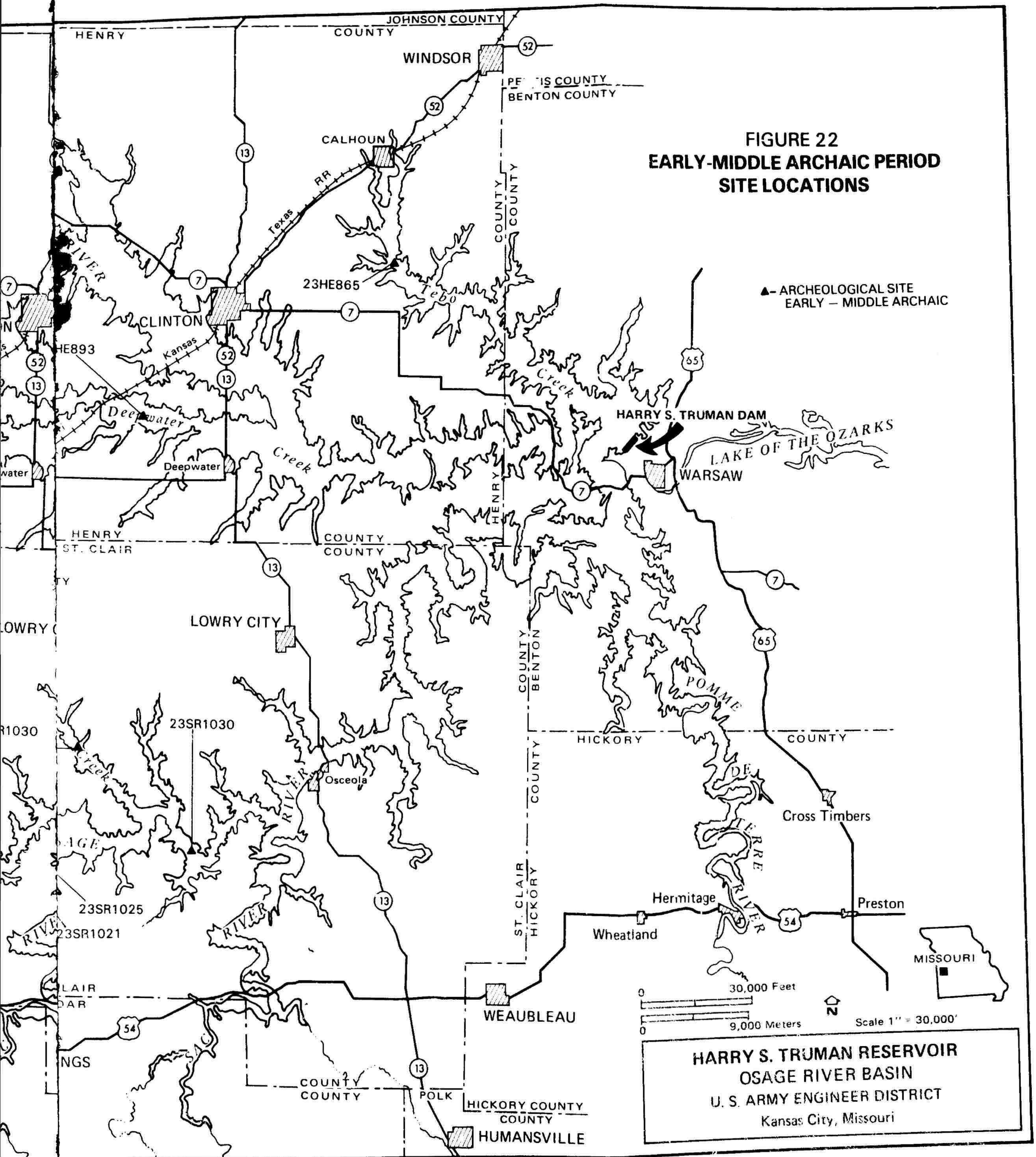
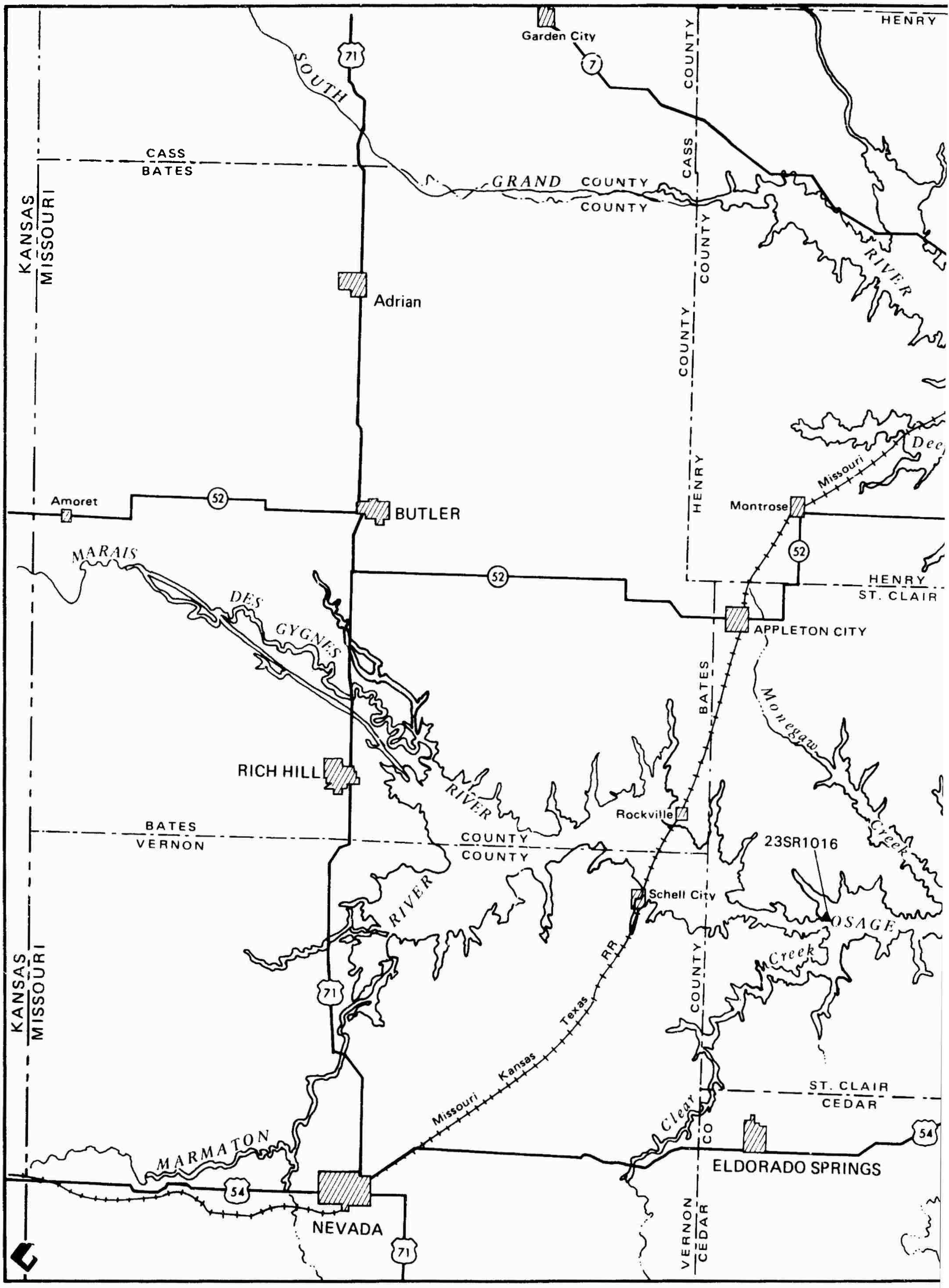


FIGURE 22
EARLY-MIDDLE ARCHAIC PERIOD
SITE LOCATIONS
▲- ARCHEOLOGICAL SITE
EARLY – MIDDLE ARCHAIC
HARRY S. TRUMAN DAM
LAKE OF THE OZARKS
WARSAW
WINDSOR
CALHOUN
CLINTON
Deepwater
LOWRY CITY
Osceola
Cross Timbers
Hermitage
Wheatland
Preston
WEAUBLEAU
HUMANSVILLE
23HE865
HE893
23SR1030
23SR1025
23SR1021
JOHNSON COUNTY
HENRY COUNTY
BENTON COUNTY
ST. CLAIR COUNTY
HICKORY COUNTY
POLK COUNTY
Texas RR
Kansas
Tebo Creek
Deepwater Creek
POMME DE TERRE RIVER
MISSOURI
0 30,000 Feet
0 9,000 Meters
Scale 1" = 30,000'
N
HARRY S. TRUMAN RESERVOIR
OSAGE RIVER BASIN
U. S. ARMY ENGINEER DISTRICT
Kansas City, Missouri


HENRY
Garden City
CASS
BATES
GRAND
COUNTY
CASS COUNTY
HENRY COUNTY
KANSAS
MISSOURI
Adrian
RIVER
Missouri
Amoret
BUTLER
Montrose
MARAIS
DES
GYGNES
HENRY
ST. CLAIR
APPLETON CITY
BATES COUNTY
Monegaw
RICH HILL
RIVER
Rockville
BATES
VERNON
COUNTY
COUNTY
23SR1016
Creek
Schell City
OSAGE
RIVER
Creek
RR
Texas
Kansas
Missouri
ST. CLAIR
CEDAR
Clear
MARMATON
NEVADA
ELDORADO SPRINGS
VERNON
CEDAR

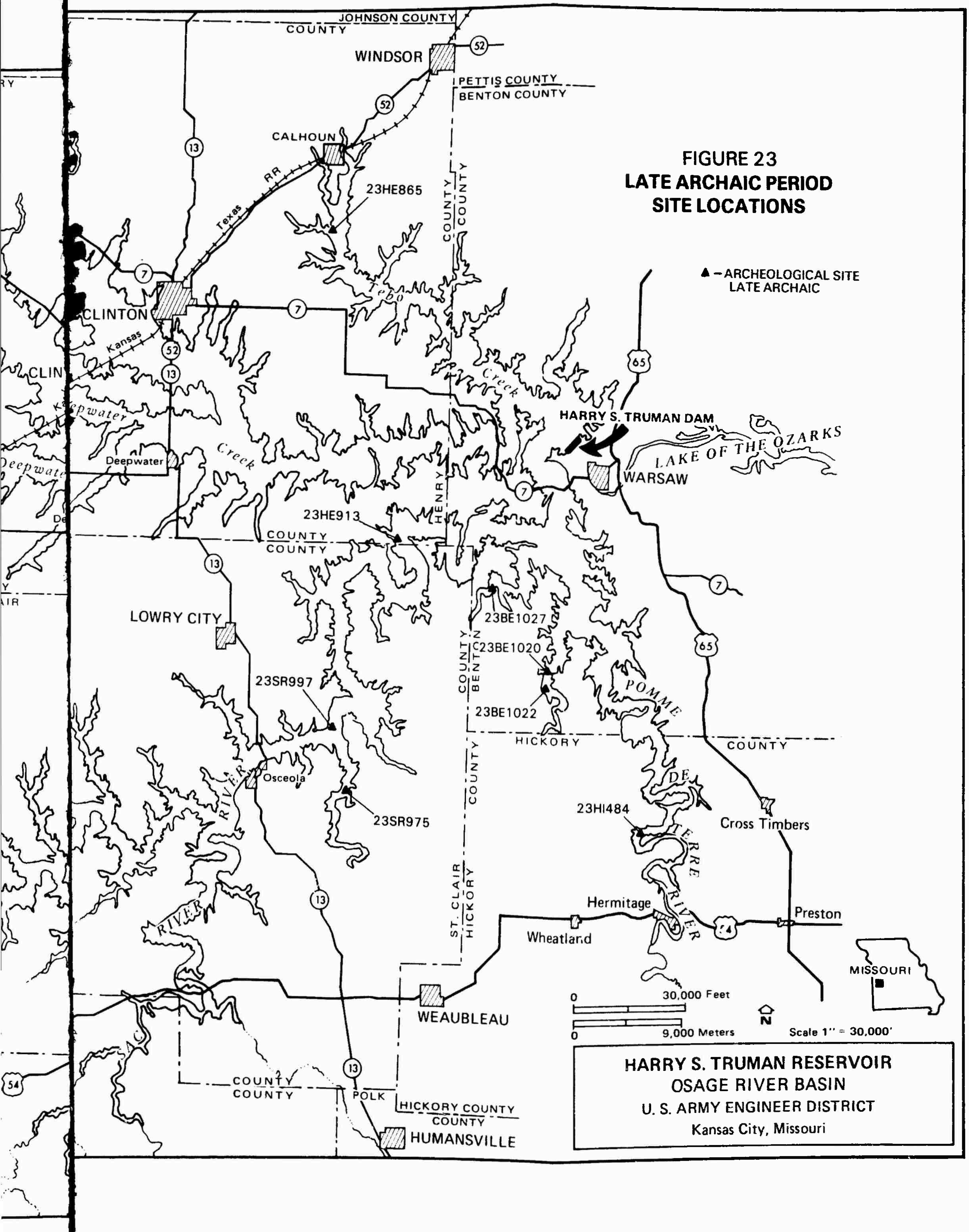
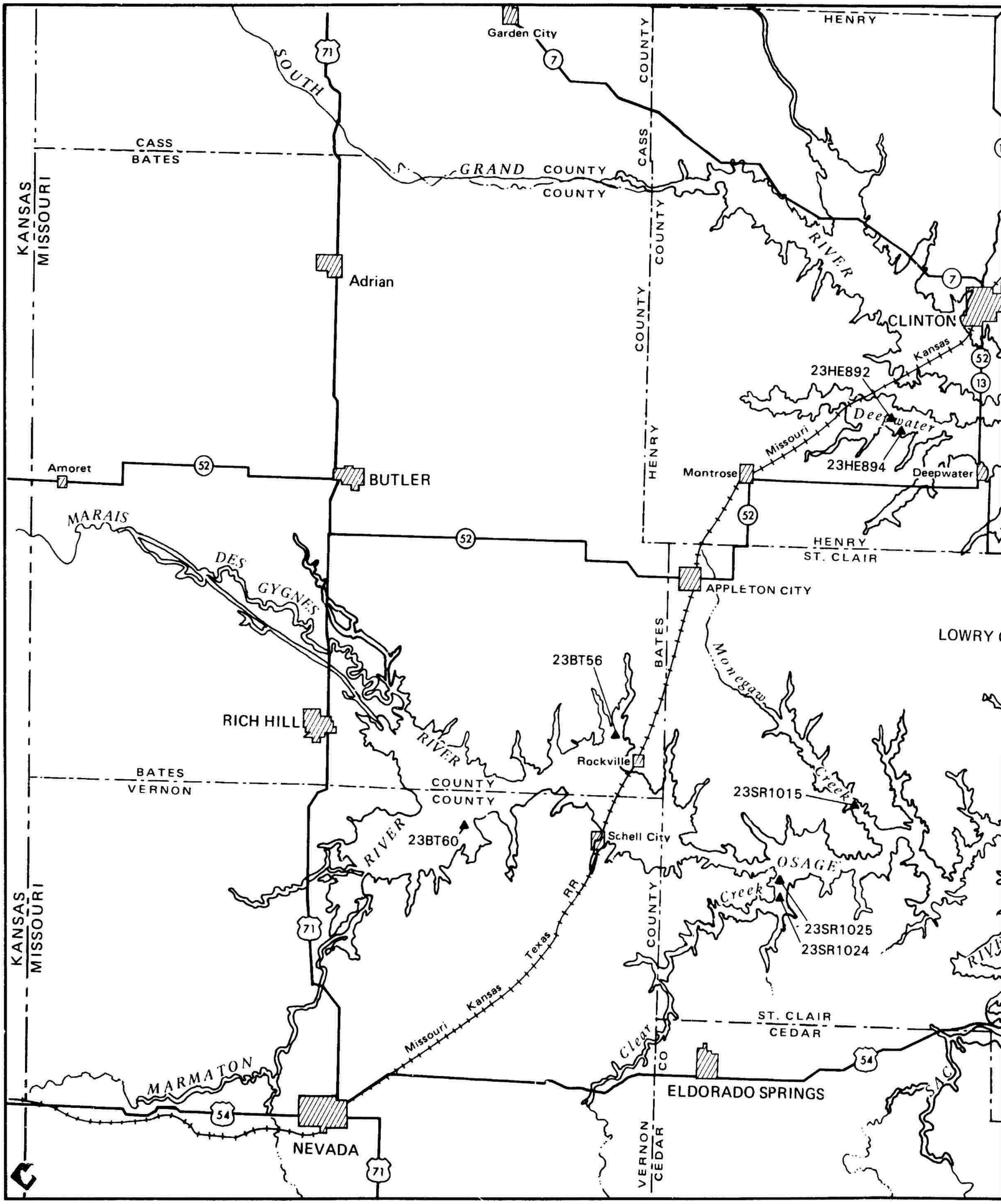


FIGURE 23
LATE ARCHAIC PERIOD
SITE LOCATIONS
▲ – ARCHEOLOGICAL SITE
LATE ARCHAIC
JOHNSON COUNTY
COUNTY
WINDSOR
PETTIS COUNTY
BENTON COUNTY
CALHOUN
23HE865
CLINTON
HARRY S. TRUMAN DAM
LAKE OF THE OZARKS
WARSAW
Deepwater
23HE913
COUNTY
COUNTY
HENRY
23BE1027
23BE1020
23BE1022
LOWRY CITY
23SR997
HICKORY
COUNTY
POMME
DE
TERRE
RIVER
Osceola
23SR975
23HI484
Cross Timbers
Hermitage
Wheatland
Preston
ST. CLAIR
HICKORY
MISSOURI
0
30,000 Feet
9,000 Meters
N
Scale 1" = 30,000'
WEAUBLEAU
POLK
HICKORY COUNTY
COUNTY
HUMANSVILLE
HARRY S. TRUMAN RESERVOIR
OSAGE RIVER BASIN
U. S. ARMY ENGINEER DISTRICT
Kansas City, Missouri



HENRY
Garden City
COUNTY
CASS
SOUTH
GRAND
COUNTY
COUNTY
CASS
BATES
KANSAS
MISSOURI
RIVER
Adrian
CLINTON
Kansas
23HE892
Deepwater
Missouri
23HE894
Deepwater
Montrose
HENRY
COUNTY
Amoret
BUTLER
MARAIS
DES
GYGNES
HENRY
ST. CLAIR
APPLETON CITY
LOWRY
23BT56
BATES
Moneggaw
RICH HILL
RIVER
Rockville
BATES
VERNON
COUNTY
COUNTY
23SR1015
Creek
23BT60
RIVER
Schell City
OSAGE
RR
Creek
23SR1025
23SR1024
KANSAS
MISSOURI
Texas
Kansas
Missouri
COUNTY
ST. CLAIR
CEDAR
Clear
CO
ELDORADO SPRINGS
MARMATON
NEVADA
VERNON
CEDAR

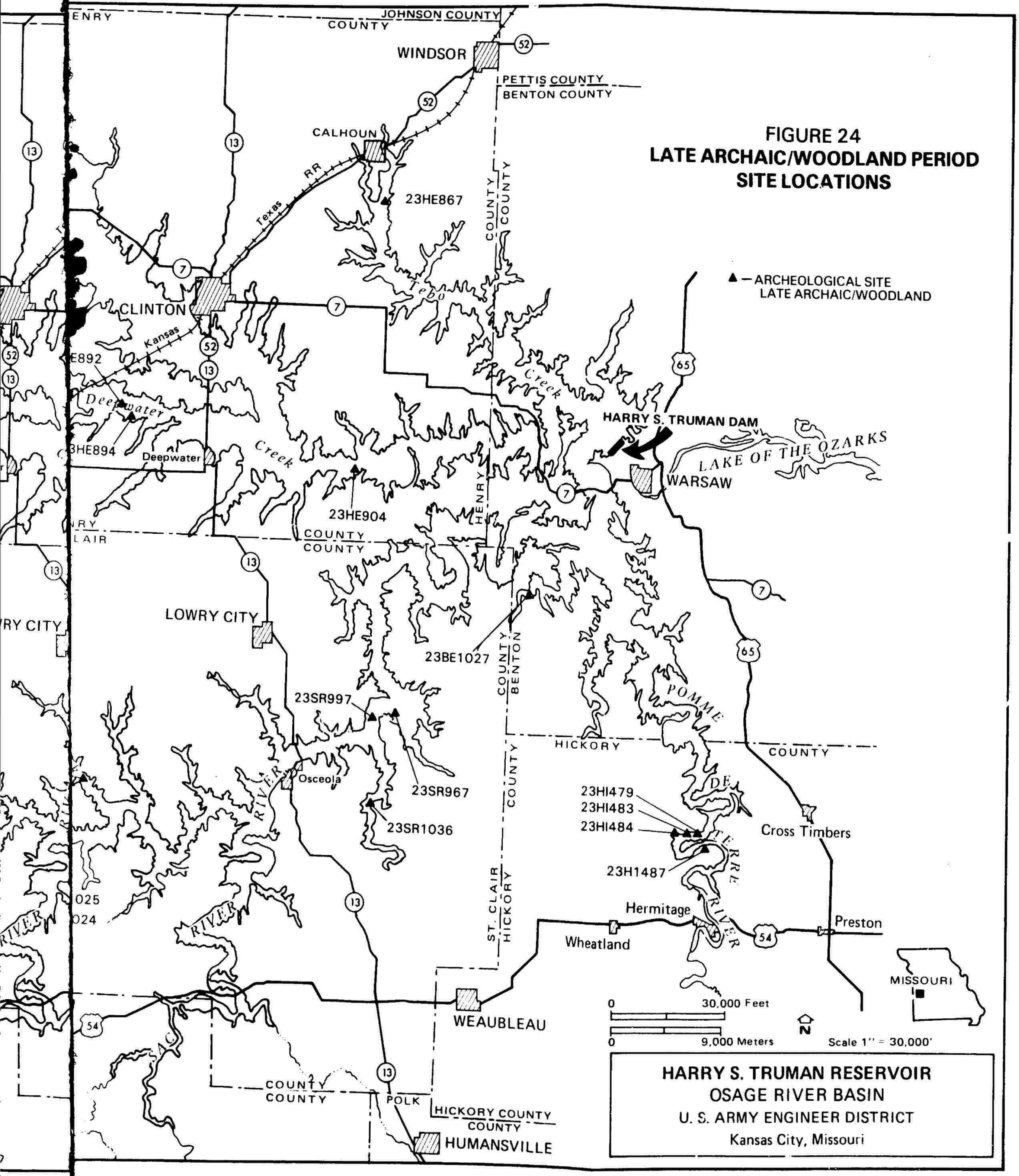
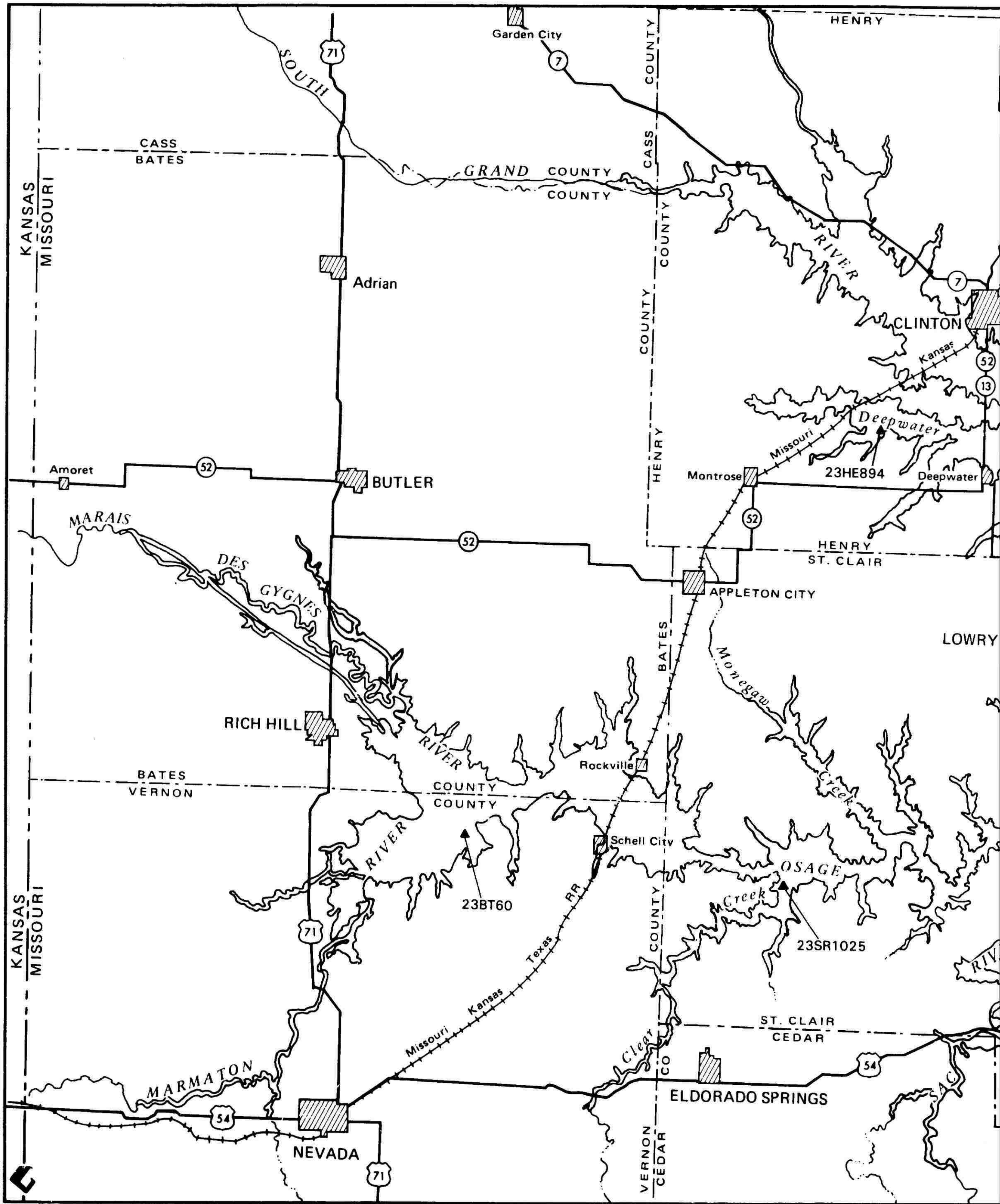


FIGURE 24
LATE ARCHAIC/WOODLAND PERIOD
SITE LOCATIONS
▲ – ARCHEOLOGICAL SITE
LATE ARCHAIC/WOODLAND
JOHNSON COUNTY
COUNTY
WINDSOR
PETTIS COUNTY
BENTON COUNTY
CALHOUN
23HE867
CLINTON
HARRY S. TRUMAN DAM
LAKE OF THE OZARKS
WARSAW
23HE904
23HE894
Deepwater
23BE1027
LOWRY CITY
23SR997
23SR967
23SR1036
Osceola
POMME DE TERRE RIVER
23HI479
23HI483
23HI484
23H1487
Cross Timbers
Hermitage
Wheatland
Preston
WEAUBLEAU
HUMANSVILLE
POLK
HICKORY COUNTY
ST. CLAIR
MISSOURI
0
30,000 Feet
9,000 Meters
Scale 1" = 30,000'
HARRY S. TRUMAN RESERVOIR
OSAGE RIVER BASIN
U. S. ARMY ENGINEER DISTRICT
Kansas City, Missouri


HENRY
Garden City
7
71
SOUTH
CASS
BATES
GRAND
COUNTY
COUNTY
CASS COUNTY
HENRY COUNTY
KANSAS
MISSOURI
Adrian
RIVER
CLINTON
Kansas
52
13
Deepwater
Missouri
23HE894
Montrose
Deepwater
Amoret
52
BUTLER
MARAIS
DES
GYGNES
RIVER
HENRY
ST. CLAIR
APPLETON CITY
LOWRY
BATES COUNTY
Monegaw
Creek
RICH HILL
Rockville
BATES
VERNON
COUNTY
COUNTY
Schell City
OSAGE
Creek
23BT60
23SR1025
RIVER
71
Missouri
Kansas
Texas
RR
COUNTY
ST. CLAIR
CEDAR
Clear
CO
54
MARMATON
54
ELDORADO SPRINGS
NEVADA
71
VERNON
CEDAR
SAC

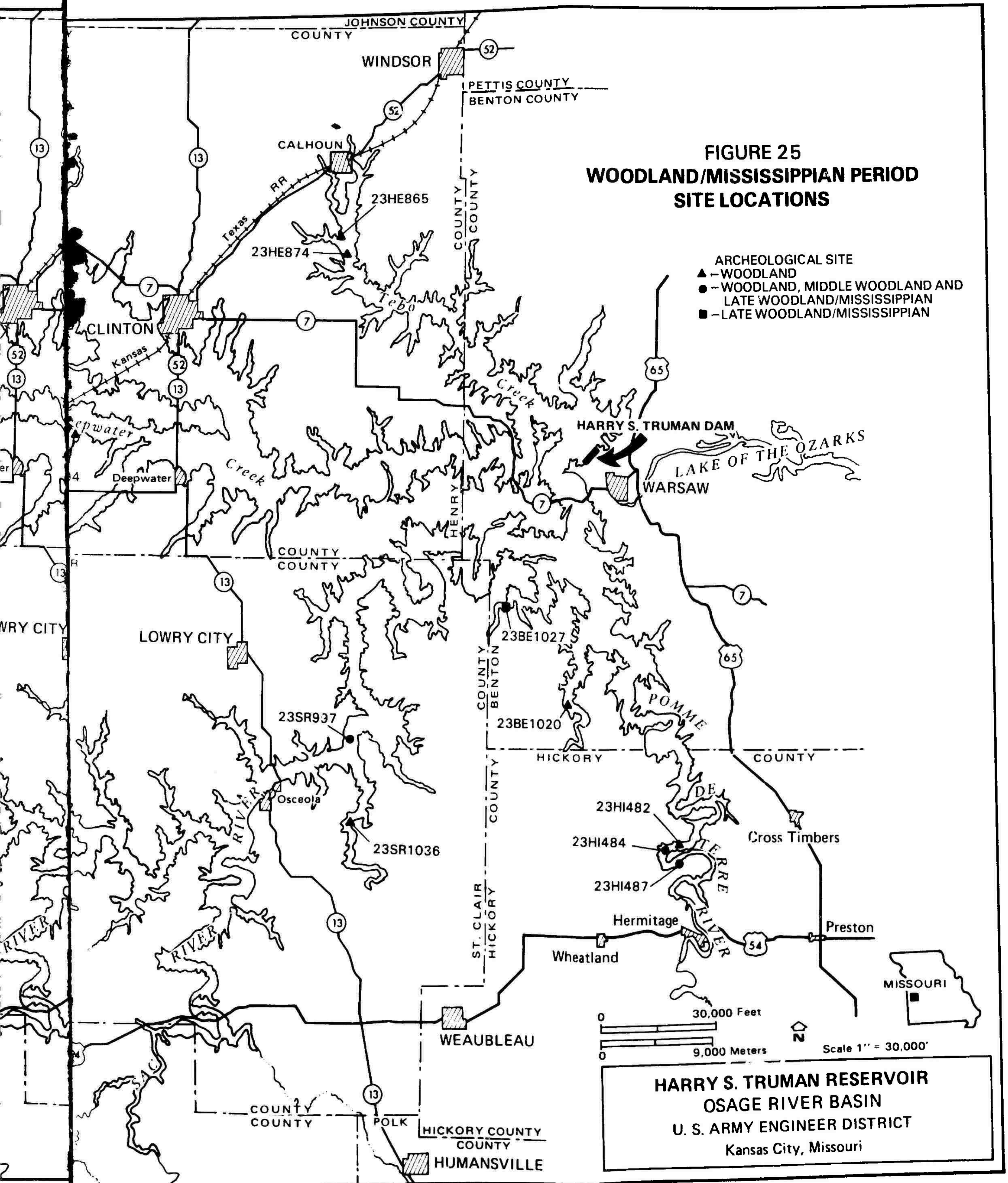


FIGURE 25
WOODLAND/MISSISSIPPIAN PERIOD
SITE LOCATIONS
ARCHEOLOGICAL SITE
▲ – WOODLAND
● – WOODLAND, MIDDLE WOODLAND AND LATE WOODLAND/MISSISSIPPIAN
■ – LATE WOODLAND/MISSISSIPPIAN
JOHNSON COUNTY
COUNTY
WINDSOR
PETTIS COUNTY
BENTON COUNTY
CALHOUN
Texas RR
23HE865
23HE874
HENRY COUNTY
Tebo
CLINTON
Kansas
Creek
Deepwater
HARRY S. TRUMAN DAM
LAKE OF THE OZARKS
WARSAW
COUNTY
COUNTY
LOWRY CITY
23BE1027
BENTON COUNTY
23BE1020
POMME
23SR937
HICKORY
COUNTY
Osceola
RIVER
23SR1036
ST. CLAIR COUNTY
HICKORY
DE
TERRE
RIVER
23HI482
23HI484
23HI487
Cross Timbers
Hermitage
Wheatland
Preston
MISSOURI
WEAUBLEAU
0 30,000 Feet
0 9,000 Meters
N
Scale 1" = 30,000'
COUNTY
COUNTY
POLK
HICKORY COUNTY
COUNTY
HUMANSVILLE
HARRY S. TRUMAN RESERVOIR
OSAGE RIVER BASIN
U. S. ARMY ENGINEER DISTRICT
Kansas City, Missouri

assemblages from the Late Archaic - Woodland group, and this group from those sites occupied only during the Woodland - Mississippian period.

## ANALYSIS OF LITHIC ARTIFACTS

### Research Objectives

The lithic analysis and interpretive framework of this phase of archaeological investigation in the Truman Reservoir Ten-Year Floodpool has been designed to examine the ways in which the lithic residue from prehistoric technological systems might be used to inform us on the organization of mobility strategies in hunter-gatherer adaptive systems. The research design presents a dichotomous outline concerning the different ways in which collectors and foragers characteristically use residential and logistical mobility. Generally, foragers move their residences quite frequently (high residential mobility) and use very little logistical mobility in the operation of their subsistence-settlement systems. Classic collectors, on the other hand, must exploit their environment through the deployment of specially organized task units and, therefore, are not under the same pressures to move their residences so frequently as foragers (see Binford 1980 for a discussion of foragers and collectors). The particular mix of mobility strategies at which different hunter-gatherers arrive is not a matter of preference but rather an adaptive response to the ecological structure of the environment each inhabits. Collectors respond to conditions which require the exploitation of "patchy" or heterogeneous resource distributions, while foragers respond to the demands of homogeneously distributed resources (see Pianka 1978 for a discussion of "patchy" and homogeneous environments). Since the prairie constitutes an excellent example of a patchy environment and the Oak-hickory forest represents a more homogeneous environment, the study area provide an excellent laboratory in which to study the articulation of collector and forager adaptations. It can be reasonably anticipated that the same human groups used both strategies in exploiting the forest-prairie border.

Just as the deployment of different mobility strategies will place different kinds of demands on the movements and functioning of consumers and producers within a social unit, so too might we expect the operation of these different strategies to place different constraints and demands on technological systems. Therefore, we might expect the organizational properties of the lithic residues of past technological systems to reflect such behavioral differences. Our task, then, is to develop a conceptual framework that identifies such organizational differences.

Based on his work with the Nunamiut, Binford (1979) has recently proposed a model relating material technology to organizational concepts. He defined technological organization in terms of how the Nunamiut perceive of their gear in "the planned execution of their adaptation." In other words, gear is organized to be responsive to goal-oriented subsistence decisions which are based on the anticipation of future conditions or events. The Nunamiut conceive of their gear as belonging to three major categories: personal gear, site furniture and situational gear.

Personal gear is carried into the field by individuals and designed to meet anticipated conditions or activities. In this sense, personal gear can be viewed as

those elements of technology which are "owned" by individuals and are designed specifically for certain planned tasks. When Nunamiut men set out on extended field expeditions, their personal gear is determined by anticipated procurement goals of the trip, their needs for comfort along the way (i.e. warmth, food, etc.) and those likely situations which might arise independently of the expressed procurement goals of the expedition (Binford 1977:31). A list of some tools in the traditional assemblage of personal gear for Nunamiut men which have a direct bearing on studies of lithic technologies includes antler "bone cutters" with inset stone blades for slotting antler and bone, "crooked knives", radial or discoid cores similar to bifaces, ice chisels, axes, fire flints, men's cutting boards, bows and arrows, quiver, bow case, sinew for sewing repairs and the construction of snares, bone needles, extra skin patches, pressure flakers, flake knives and large flakes for butchering (Binford 1979:262-263).

These tools are generally designed for relatively long use-lives, performing the same use(s) over an extended number of applications. In most cases, these tools are involved in intensive processing episodes (i.e. butchering, hide scraping, etc.) where they receive heavy use over short periods and are then returned to a long "passive" state until their next application. Applications are generally specific to certain kinds of uses. These conditions of use result in tools or components of tools which must be intensively maintained to retain an efficient working edge, to guarantee a continued and acceptable fit between complementarily arranged components of a composite tool form such as a hafted knife, a harpoon, "bone cutters", etc., and to prolong the use-life of the tool. This latter concern results in resharpening strategies which conserve the effective length or circumference of working edges by maintaining or increasing the symmetry of the resharpened tool part (see Goodyear 1979). The tendency for many of these tools to be designed for long-term hafting and symmetrical maintenance strategies, produces a set of tools which are highly formalized and consistent in their design properties.

An excellent example of a stone tool meeting all of these requirements would be the projectile point which characteristically is thought to function as the blade component of a hafted knife. Commonly, hafting elements of projectile points exhibit distinctive forms (i.e. fluted bases, corner- and side-notches, square stems and tapered stems, etc.) related to different kinds of strategies for attaching stone blades to shafts. Blades also exhibit special kinds of forms (i.e. oppositely bevelled, alternately bevelled, even bifacial or aspects of blade curvature) related to specific kinds of resharpening strategies which were intended to increase the use-life of the tool. The reasons behind variability in projectile point resharpening and hafting strategies are not well understood at present, but the formal and maintenance characteristics indicate that such tools were designed for long-term use in a haft.

Binford (1979:262) makes reference to another form of personal gear in the Nunamiut assemblage, a disc shaped core, which is distinguished from most other forms in this category by the fact that it was not designed for hafting at all:

> Informants always spoke of carrying 'cores' into the field; as they put it, you carry a piece that has been worked enough so that all the waste is removed, but that has not been worked so much that you cannot do different things with it.

> These cores were described as shaped like discs of different sizes; the only item pictured in the books which I had at Anaktuvuk for comparative purposes that were identified as like the "cores" their father carried were the "discoidals" pictured by Giddings (1964:56). That the items being described by the informants were in fact cores, was made clear by many references to the removal of flakes radially around the disc for use in butchering animals, the manufacture of scrapers from flakes struck from the 'long side' of the oval, and the fact that once you had reduced the core down to a very small size you had a 'round scraper.'

In many prehistoric assemblages, the objects Binford refers to could be reasonably identified as bifaces. He stresses the multifunctional character of these tools and the use transformations that can occur as a result of increased reduction throughout the life-history of these forms. From this passage it is clear that these disc cores began as rather large, radially retouched pieces of material that could be used to produce flakes or to perform a number of other uses as a processing or extraction tool. As the core area is reduced through continued use, the use-options for the core become increasingly constrained until, in its final stages, it principally serves only as a "round scraper." Reduction in size in the later life-history stages nearly exhausts or completely eliminates the use of these cores as flake producers and severely restricts the number of optional uses since smaller sizes would make heavy duty tasks less appropriate.

Keeley (1980:161) has presented similar arguments concerning the functioning of bifacial handaxes:

> Considering the facts mentioned above, it seems reasonable to propose as a hypothesis that handaxes, at least in the British Middle Acheulean, were implements made to be taken on hunting and gathering expeditions away from the home base, while in the main, flake tools provided the cutting edges 'at home'. Why not take, on such expeditions, a collection of flakes, which have sharper cutting-edges? The answer may be that the advantage of the handaxe lies not in its suitability for any one particular task, but in its usefulness for any number of tasks. The retouched edge of a handax may provide a sturdy, resharpenable cutting edge with a variety of edge angles; its weight and compact form make is usable as a chopper and hammer (signs of heavy battering on one side of the heavy butt is not an uncommon feature of larger handaxes); the point on some types of handaxes renders them useful both for stabbing and for more delicate tasks like boring or prying; while, if the implement is large enough, the handax can even serve as a core from which flakes providing additional cutting edges can be struck. To provide for all these tasks with flakes, one would need to carry an inconvenient number of them of various sizes, shapes and edge angles, plus, perhaps, a core and hammerstone -- not a very handy assortment to carry on the

chase. And when the hungers (or gatherers) were ready to return home, laden with meat (or other material), the handaxes could be abandoned if necessary, since others could easily be manufactured at the home base.

Concepts concerning the functions of bifaces have been slow to develop in the study of lithic technology, probably as a consequence of the variable morphologies of bifacially flaked artifacts in the archaeological record. These morphological variations have been responsible for any number of suggested uses like axing, adzing, picking, cleaning, cutting, scraping, etc. Yet, many are fragmentary and frequently do not exhibit observable traces of wear along their edges. This had led some (i.e. Kay 1978) to posit that bifaces most commonly represent a category of shaped artifact called a preform and that the predominance of fragments in archaeological assemblages constitutes a clear demonstration of the frequent occurrence of manufacturing rejects. The term "preform" implies that a finished product of this hypothesized reduction sequence must exist. But what would this product be? Certainly it would be wasteful to bifacially reduce a large piece of lithic material down to a size adequate to manufacture a projectile point, as well as more difficult than simply using flakes as preforms for these tools. Other tools which commonly occur in lithic assemblages such as endscrapers, steep-edged unifaces and other retouched and utilized flakes are also clearly not the end product of biface reduction. The only feasible consequence is obviously a smaller biface. This implies that biface manufacture is immediate and the desired end product, a small biface, is produced with each manufacturing episode or the process is aborted by breakage. If this were the case, why it is that bifaces exhibit such vast morphological variability in size, shape of functional edges, flaking characteristics, wear intensity and wear type?

Perhaps a much more satisfying consideration of bifaces is contained in statements such as those made by Keeley and Binford above. The morphological variation that we observe may be a product of delayed reduction strategies as opposed to immediate ones. If indeed we can view bifaces as a special kind of personal gear designed to be responsive to situations as they arise in a highly mobile context, then we can provide a comprehensive explanation for this variation. Within this conceptual framework, a biface begins as a rather large, but transportable, piece of raw material that has been shaped bifacially. At this stage, it can serve as a source of flakes for certain tasks as they present themselves in the operation of a subsistence system or it can serve as a hand-held tool. Because of its larger size at this stage, it might be most appropriately applied to heavy duty tasks such as wood chopping or heavy duty butchering (see Keeley 1980). Through continued use, resharpening, and flake production the size of the biface will become reduced both in thickness and in edge perimeter. Its effectiveness as a flake source will gradually decrease and it will also become less appropriate as a hand-held heavy duty tool. In a hand-held mode, it will more aptly suit lighter duty tasks such as cutting or scraping. The need to conserve the area of the biface for flake production in conjunction with the need to maintain its "tool-like" characteristics results in a gradually increased symmetry of form as the tool is reduced. This is manifest in the flaking characteristics of the faces, which exhibit more and smaller flake scars with continued reduction, and in the edges which become straighter as a result of this same process. At a certain point in this delayed reduction sequence, increased symmetry of form can result in these tools becoming

suitably shaped for hafting. In a hafting mode, the remaining flake production qualities of the biface may be completely ignored in lieu of the great mechanical advantages a hafted implement can offer. The use of bifaces for axing and adzing has been duly noted in the literature of lithic technology (see Semenov 1964, Morse and Goodyear 1973 and Goodyear 1974) and recent wear analysis of bifaces from the Haw River site complex in North Carolina (see Claggett and Cable 1982) would suggest that axing may have served as a primary function for reduced bifaces in some contexts.

Therefore, in a broad sense, large bifaces may indeed serve as "preforms" for smaller bifaces, but the reduction process need not be immediate. The immediate manufacture model for bifaces, in fact, ignores much of the variation in biface morphology and wear that demands explanation if we wish to observe the functioning of these tools in a systemic context. Ultimately, it can only provide a partial explanation of the variability expressed in the archaeological record for bifaces and in this respect is very unsatisfactory. A delayed staging model, on the other hand, is more comprehensive in its treatment of the bifaces and achieves a much more satisfying explanation for morphological variability in this tool form. That most bifaces are broken in archaeological contexts should not be a surprise nor should it serve as a "backdoor" justification for the immediate manufacture model. In fact, to assume that the vast majority of bifaces in the archaeological record are manufacturing rejects simply because they are broken is not only unwarranted but would also imply a very low rate of success for the production of such implements. Given the assumptions of the delayed staging model, bifaces would be useful either as cores or tools until their symmetry is destroyed by breakage. At that point, their usefulness as a transportable element of personal gear would decrease substantially and their probability of discard would greatly and suddenly increase.

Central to these arguments is the rate of utilization. Those that would support the immediate manufacture model point to the fact that bifaces in their assemblages are hardly ever used (i.e. Kay 1978). It is quite likely that the frequency of observable use on bifaces is tied to the function of a locus in an overall settlement pattern. The Folsom occupation at the Hanson site, for instance, appears to represent a bison hunting camp (see Frison and Bradley 1980). Bifaces and discoidal cores (early stage bifaces) were used as the basic sources for flake production and only 18.4 percent (Frison and Bradley 1980:22) of the recovered bifaces exhibited evidence of use. Is this low use rate a result of immediate manufacturing of bifaces of a result or the use of bifaces primarily as flake producers in this context? Since all bifaces were broken, it would be difficult to explain why 18.4 percent were used if the immediate manufacturing model were to be applied in this instance. At the Haw River site group (see Claggett and Cable 1982), in obvious residential contexts, edge and facial polish was present on 90 to 95 percent of the bifaces in the assemblages of each Archaic occupation.

Residences are expected to be the discard locus of most exhausted tools which survive the rigors of the field (see Binford 1977, 1979) and it is in such contexts that we would expect high frequencies of late stage bifaces. Since residences, at least in the Nunamiut system, are also the loci of gear replenishment and preparation for future field excursions, we might expect significant frequencies of large biface manufacturing rejects and caches of "field ready" biface cores

at these sites as well. In field situations we might expect bifaces to occur primarily in broken conditions and to be of a more consistently reduced form. Residences should contain higher percentages of whole bifaces both in the initial stages of reduction and in the final stages since preparation for the field will involve initial stage biface manufacture and the discard of exhausted whole bifaces which have survived field trips. Broken bifaces in this latter context might relate to use and breakage in the immediate environs of the residence or it might relate to those portions of a biface that are returned to the residence still secured in a hafting device.

In summary then, there appear to be two basic major categories of personal gear in the Truman Reservoir lithic assemblage: projectile points (or hafted bifaces) and bifaces. Projectile points appear to be designed for long-lived endurance and intensive and specific processing functions. Bifaces, by contrast, appear to be more multi-purpose in nature and are maintained through a delayed reduction sequence which gradually transforms the functional character of the tool. In its initial stages, it probably serves as a flake producer and a hand-held, heavy-duty, multipurpose tool. As it is reduced, these functions give way to lighter duty hand-held functions or to hafted functions. Bifaces, therefore, are designed to be flexible and variably used in response to situations as they occur. Its design, therefore, is more general in character than projectile points. The "responsiveness" of bifaces gradually decreases through the sequence of reduction and it is likely that as initial stages are transformed into late stages other initial stage bifaces are enlisted to fill this deficiency. Thus, it is possible that both early and late stage bifaces formed elements of the personal gear of prehistoric hunter-gatherers at any one time. From this perspective, then, bifaces are viewed as operating within a very complex life-history trajectory that is responsive to a wide array of design requirements.

Site furniture is the second kind of gear described by the Nunamiut (see Binford 1979). Site furniture is considered to be anticipatory in nature, but, unlike personal gear, is thought to be the property of the community. It is characterized by low use ratios (extended life histories) and is typically stored or left at a site to be reused upon subsequent reoccupations. Examples of this gear type from the Nunamiut assemblage include: hearth stones, hearths, anvils used for pounding bones for juice or grease, Kaotahs (used as an elongated hammerstone or a large scraper for removing the periosteum from long bone shafts), tent weights, support sticks, antler racks for meat drying, worn wooden "meat dishes," old cooking buckets," lithic raw material in variable forms from cores to flakes, sled runners, firewood and ladles. Site furniture on special purpose sites such as hunting stands is often made up of laterally recycled objects such as worn out kettles and other containers like those mentioned above (Binford 1979). Much of the technology which comprises site furniture can be equated with de facto garbage (Schiffer 1975). It is discarded after use at a location, but is potentially re-useable upon subsequent occupations. If we were to apply this concept to chipped stone technology we would, of course, find ourselves in a typological quandary. Is an item, once discarded, no longer an element of other gear types but rather only a piece of de facto garbage? In an archaeological context this might be true, but we are equally interested in the original systemic context of these artifacts. Thus, we can view them simultaneously as resembling representing a certain kind of gear and as de facto garbage. Elements of site furniture with no other gear type association such

as hammerstones, grinding stones, pitted cobbles, etc., are more appropriately viewed as de facto garbage. Unfortunately, very few items of site furniture were recovered during the collection of artifacts from the sites on the survey. For this reason, site furniture is largely ignored in the following analysis.

Situational gear is the final category acknowledged by the Nunamiut. Gear of this type is generated as a response to unanticipated or unpredictable situations, or when the use of an element of personal gear would be innappropriate. The design of situational gear is constrained only by the available raw material which may be obtained from a cache, broken or discarded elements of personal gear, natural material resources of the immediate environment, or scavenged material from previous occupations of a particular location. Thus, situational gear is very expedient in its design, quite variable in morphology and usually enlisted to perform a function during a single activity. These activities are usually unpredictable in terms of when or where they will occur, but not necessarily "unanticipated" in the more general sense of the term.

Two types of situational gear occur in the chipped stone assemblages of the Truman Reservoir: 1) flake tools and 2) expedient cores. Flake tools are expediently fashioned and variable in form. Hayden (1977, 1979) has recently cautioned against a straight morphological classification of these tools based on his own observations of stone tool use among the Western Desert Aborigines. He found that resharpening intensity and edge shapes both cross-cut use types and were therefore not infallible classificatory principles (Hayden 1977:180):

> Obviously, adzes were nearly always retouched, if merely because unhafting and rehafting are time consuming, and once a piece is in the haft it is in self interest to get as much use from it as possible. Nevertheless, hafted adzes are sometimes removed without being retouched, either because of breakage, unsuitability, or poor resharpening potential.

However, out of 51 whole adzes observed in use by Papunya in the Western Desert, (Hayden 1979a:12) would have classified 36 as adzes or scrapers, 14 as utilized flakes, two as notched implements, two as backed pieces, and one as a possible truncation (this breakdown totals more than 51 because adzes that could be classified differently by different typologists were counted twice by Hayden). Thus, even in the most formal tool class of the Western Desert Aboriginals, there is a significant amount of morphological variation that could have resulted in two major and three supernumerary classes of artifacts had the Papunya assemblage been analyzed from a traditional archeological perspective.

In the case of flake tools, then, we might be ill-advised to place heavy reliance on the assumption that form follows function. Hayden (1977:182) observes that stone tool form in the Western Desert assemblage, which is overwhelmingly situational in nature, is not the result of preconceived notions of the way a tool should look, "but rather mechanical results of having to create or resharpen a cutting edge one or more times." He surmises that retouch intensity on most of the flake tools of the assemblage is actually determined by the quality or availability of raw material, the appropriateness of an edge for resharpening, or the events which happen during the completion of a particular task. Therefore, in Hayden's

experience, use is more strongly associated with gross morphological attributes such as effective edges whose shapes never strictly conform to specific shape or size criteria.

Expedient cores are masses of lithic raw material which were used to produce large flakes and were generally discarded at their locus of procurement in an expedient fashion. That is, they generally were not transported for great distances. Biface or discoid cores provide a much more portable design for long distance transport and, in fact, we have already noted that the Nunamiut traditionally carried radial cores (biface or discoid cores) on their journeys. Expedient cores, by contrast, are bulkier, more irregular in shape and vastly more awkward to transport. Secondly, the overall design of these cores is to facilitate large flake production, a strategy not consistent with the conservative nature of transported items. To carry a heavy and awkward piece of lithic raw material over a long distance just to discard it after one or possibly two uses would be extremely costly compared with the amount of energy expended in its transport. Hence, expedient cores are viewed as gear immediately discarded, usually after a single use, and which are not transported.

A final lithic artifact class which will be discussed consists of the manufacturing debris or debitage from the lithic portion of the technological system. This class includes whole and broken waste flakes and small chunks of various shapes.

**Differences In Lithic Assemblages of Forager and Collector Strategies**

Given these general observations concerning the organization of chipped stone tools and by-products, it is now possible to generate some expectations about the way in which lithic technologies are organized under conditions which would favor forager strategies versus conditions which would more likely produce collector strategies. Forager strategies require frequent residential moves. The distribution of subsistence resources rarely forces members to extend their ranges to distances which would prohibit daily return to the base camp. Under these conditions, members gain daily access to the resources of a base camp and in this sense, very seldom find themselves in a situation where economizing technology is necessary. Access to fresh tools and raw material is available on a daily basis. Collector strategies, on the other hand, require that specially organized task groups often spend extended periods away from a residence in the pursuit of resources. Trips of this nature are usually conducted under scheduling constraints, i.e. the unit must be in a certain place at a certain time to successfully accomplish its subsistence goals. This raises the costs of commuting and hunting time, leaving less time for other activities including gear replenishment. Under these constraints a condition of scarcity develops which places greater emphasis on economizing technological strategies to meet scheduling demands.

By economizing technological strategies, we mean those strategies which would serve to minimize transport costs of lithic raw material, or to conserve the use-life of a tool or the raw material reservoir of the group (i.e. recycling, maintenance, conservative flake production techniques, etc.). Drawing upon our understanding about the way in which the five lithic artifact classes (bifaces, projectile points or hafted bifaces, flake tools, expedient cores and debitage) discussed above functioned in prehistoric technologies, then, we can begin to

generate a set of expectations concerning the forms and conditions that each class should manifest under the opposing collector and forager strategies. A brief outline of these expectations follows.

Since collector strategies should emphasize economizing technological organizations, we would expect the following patterns to become manifest:

1. Bifaces should dominate flake production strategies.

2. Bifaces should exhibit a high degree of reduction and should primarily appear only in a broken state on special purpose sites.

3. As a logical consequence of 1. and 2., debitage should be smaller and less variable in size than in foraging assemblages.

4. Flake tools should also be smaller and less variable in size than in foraging assemblages.

5. Since collector systems are more specialized in the kinds of resources exhibited, flake tools should be less complex and exhibit fewer uses than in foraging systems.

Foraging strategies should manifest the following set of expectations:

1. Flake production strategies should be more variable including higher frequencies of expedient core flake manufacture.

2. Bifaces should be more variable in size and life-history stage as a result of need for raw material conservation.

3. As a logical consequence of 1. and 2., debitage should be larger and more variable in forager systems than in collector systems.

4. Flake tools, by virtue of the more variable flake production techniques, should be more variable in size and larger than in collecting assemblages.

5. Since forager systems are less specialized in their pattern of resource exploitation, flake tools should be responsive to a wider variety of uses and therefore should be more complex and functionally diversified than in collector assemblages.

We would like to state that we have obtained a workable picture of the settlement pattern in the project area and feel confident that we have a representative sample of site types. This, however, is not the case. First the lands within the Ten-Year Floodpool do not accurately reflect the microenvironmental variation present in the region as a whole. The survey was confined primarily to areas immediately adjacent to the major drainages and therefore is biased toward river and stream based sites. These sites should generally be more residential. If there truly are differences in the way lithic technologies are organized by collectors and foragers, these differences will be minimized by the fact that we

will primarily be comparing data from residences. Special purpose sites, which would be expected to exhibit the greatest degree of typically collector strategies, are most probably located in the inter-riverine or upland areas of the region where survey coverage was minimal. Secondly, the problems of sampling and visibility in forested areas creates an internal bias in collections that is difficult to evaluate. Given these constraints, we can provide only a very gross comparison between environmental zones and we do not expect differences between these zones to be great.

Rather than approach environmental comparison from a site specific settlement pattern perspective, then, we at present can only propose that areas within the survey be compared at a gross areal level. To accomplish this purpose, the 24 strata were aggregated into 8 environmental areas in relation to drainage patterns. They are listed below:

1. Pomme De Terre Aggregate (Strata 1, 2, 3)

2. Rock Shelter Aggregate (Stratum 4)

3. Middle Osage Aggregate (Strata 5, 6, 7, 8, 9, 10)

4. Lower Osage Aggregate (Strata 11, 12, 13)

5. Tebo Creek Aggregate (Strata 14, 15, 16)

6. Lower South Grand/Deepwater Creek Aggregate (Strata 17, 18, 19, 20, 21, 22)

7. Middle South Grand Aggregate (Stratum 23)

8. Upper Osage Aggregate (Stratum 24)

The basic relationship that we will be interested in monitoring is that between Aggregates 8 and 1. The latter represents a fully forested area and the former is clearly grassland at present. If we are to observe differences in the way forests and grasslands were used by prehistoric hunter-gatherers in the project area, these differences should be clearest between these two aggregates. They also represent the most intensively collected areas of the survey and thus provide the units most amenable to statistical comparisons. As the other aggregates correspond to different locations or drainages, they should provide a basis for observing variation in exploitative patterns at a finer scale.

### Lithic Analysis Program

Separate analysis programs were set up for the five classes of artifacts discussed above. Attributes were selected to reflect six salient features of technological organization: 1) design; 2) planned maintenance or resharpening strategies; 3) repair; 4) breakage patterns; 5) use; and 6) reduction staging.

Design relates to those attributes of stone tools which are the consequence of what Deetz (1967) would call "mental templates." This would include the stylistic or

cultural-historical characteristics of traditional classifications and the projected functional specifications of tools designed to perform specific actions or uses. Often the same attributes can be used to address both of these aspects of design. For example, observing haft morphology or basal treatment on projectile points is as useful in studying function as it is in defining culture-historic types. The kinds of design constraints placed on tools, as discussed previously, is a function of the organizational levels within a technology. The design of personal gear is the most formal and consistent of the organizational types since these tools are required to pursue anticipated subsistence goals. Their design constraints, therefore, are very narrow. Depending upon the character of the adaptation these constraints can be extremely narrow or more general in nature. By contrast, situational gear exhibits very few constraints on design (i.e., Hayden 1979a) because it is responsive to unpredictable situations. Diachronic comparison of design constraints within and between artifact classes can provide a basis for discussing directional change in technological organizations.

Planned maintenance refers to those aspects of technological organization which relate to strategies of tool rejuvenation. Principally, this would involve resharpening strategies. Again, personal gear should exhibit the most formalized and consistent strategies of maintenance. Goodyear (1979) argues that symmetrical rejuvenation strategies exhibited on Clovis Points, and the highly predictable, siliceous raw materials which were used, prolonged the use-life of this tool in the operation of the highly mobile Paleo-Indian subsistence settlement system. In another case, Hayden (1979a:12,80) contends that retouch on adzes in the technological system of the Western Desert Aborigines is mostly a result of the kind of use to which the tool is put. Since adzes are hafted in their use context, retouch is applied to avoid the labor intensive task of rehafting. Whereas the retouch techniques exhibited on Clovis points are characteristically symmetrical and finely applied with a pressure flaker, retouch applied to Australian adzes is rather coarse, accomplished with a hard hammer, and is characteristically irregular. These differences relate to the different functional demands placed on these tools. As the intended uses and design constraints of tools vary, so will the planned maintenance strategies. Comparisons within classes should be useful for discussing changes in the organizational characteristics of technologies through time. For instance, a decrease in retouch symmetry could suggest a relaxation of constraints on the potential uses of a tool. In other words, a trend toward multipurpose application could be traced by monitoring maintenance strategies.

Repair and breakage patterns can inform on several levels of organization. First, the kinds of unrepaired breaks that occur on discarded tools can demonstrate the character of design constraints that are placed on those tools. (These patterns will be most obvious when examining formal tools such projectile points.) Breaks which would not appear to render a tool inoperable, but which do result in its discard might indicate that this tool functioned within a very narrow range of constraints (i.e., the tool is highly specialized). A high incidence of repair modifications to breaks might suggest a more general function. In addition, the types of breaks exhibited within a class can show the structural weaknesses of a tool form given the range of its use applications. In this sense, breakage patterns provide one perspective on the evolution of a particular class of tool through time.

The concept of use has been discussed in some detail earlier in this chapter. A detailed microwear study could not be undertaken within the framework of this project, but certain macroscopic wear characteristics were noted and incorporated into the assemblage analysis. Edge damage in the form of drilling and nibbling was monitored so that tools not exhibiting retouch could be included in the analysis, primarily as situational gear. Following Dunnell's (1971, 1978a, 1978b) suggestions, each edge exhibiting damage and/or retouch was analyzed separately. Reuse or recycling (see Schiffer 1976) of tools was also monitored, as another indication of the level of curation within an assemblage.

Reduction staging refers to strategies of raw material procurement and gear replenishment. These activities usually occur in staged sequences which can be temporally separated. The manufacturing debris found on archeological sites holds clues to the character of reduction strategies and technological organization within adaptive systems. Binford (1979) comments that lithic procurement strategies in the Nunamiut, and hunter-gatherer systems in general, are embedded in and subservient to the subsistence strategies of the group. In other words, procurement of raw material and replenishment of gear is generally opportunistic and is accomplished during what he calls "downtime" as an adjunct to subsistence concerns. This denies the popular view that quarrying is a discrete activity requiring special procurement trips and preparations (e.g., House 1975). It seems likely that the degree to which quarrying becomes a discrete activity within a subsistence-settlement system should depend on the character of lithic and subsistence resource distributions in particular environments. Environments containing ubiquitous distributions of lithic material would provide many opportunities for material replenishment, and very few accommodations and logistical plans would be required. By contrast, environments with scarce and localized lithic sources would require a more planned procurement strategy, especially if subsistence and lithic resources are widely separated.

In this light, the information recorded can be viewed as a storehouse of potential experiments involving the relationships between variables whose theoretical importance we have only a glimmering knowledge of at present.

### Analytic Methods and Classification Procedures

After all the information was analyzed, it was coded on Fortran coding forms and sent to the Institute of Social Research at the University of Michigan for keypunching. As various segments of the data were keypunched, it was taken to the Michigan Computer Center, where the project account for computer services had been previously established, and lists of the raw data were made. These lists were then transported back to the laboratory where they were carefully examined for both keypunch and coding mistakes. After the card decks were "cleaned", they were returned to the University of Michigan Computer Center where the information was entered into the computer's file storage system. Before discussing file storage, however, a brief review of the Michigan Computer System is necessary.

The nucleus of the Michigan Computer Center is a high performance Amdahl 470v/6, which is similar in many respects, to the IBM/370 series. As with the IBM machines, the Amdahl exhibits a wide degree of flexibility regarding the types of input and output accepted by the system. For example, the 470 is linked to the

Merit Computer Network, which allows direct communication between the computer at the University of Michigan and other computers located around the state. The Merit System also has the capability of communicating with other nationwide computer systems.

The University of Michigan's computer system is operated by a set of programs called the MICHIGAN TERMINAL SYSTEM (MTS). These programs are responsible for every aspect of the computer's use from answering the simplest commands to updating each user's financial status at the end of each run. For a detailed description of the University of Michigan's Computer Center facilities and capabilities the reader should consult the Introductory User Guide Series published by the computer center.

One of the major assets of MTS is the simplicity with which collections of data (files) can be entered, manipulated, and extracted from the system. Large data files may be read into computer memory, by creating a file name, (generally descriptive in nature, user's choice, but must be less than eight characters in length) and loading the data into the file space allocated for that particular name. File storage then, is faster, plus it has the added advantages of file editing and manipulation over the use of more cumbersome card decks, which are more susceptible to error (e.g. misplacement or loss of a card).

For these reasons, it was decided to store the Truman data in computer memory. Two files were created for each major artifact category. Both safety and security concerns dictated this strategy. As a precaution against something or someone causing either partial or total destruction of one file, another file existing under a separate account number could be immediately accessed without loss of valuable time or information.

**Data Reduction and Classification**

Once the Truman data had been "cleaned" and put on file, the data reduction process began. One of the primary goals of this analysis was the development of a classification scheme based on the artifact's quantative attributes. Two statistical techniques were judged suitable for this purpose: discriminant function analysis and breakdown. Once precondition of discriminant function, however, is that the phenomena which are being grouped exhibit ordinal scale of measurement. The first step in the classification procedure was to transform those variables which would act as groups for the discriminant function analysis from interval level data to the ordinal scale of measurement. This transformation may be accomplished most effectively once the underlying distributional qualities of the data are well understood. Statisticians have developed several simple methods to observe these properties of the data. Fortunately, the Statistical Package for the Social Sciences (Nie et al. 1975) incorporates many of these methods under one procedure name called Frequencies.

The Frequencies procedure involves the computation of such statistics as the mean, median, mode, standard deviation, variance, skewness and kurtosis. These particular statistics measure such distributional qualities of the data as central tendencies (mean), degree of dispersion around the mean (standard deviation and variance), and the shape of the distribution (skewness and kurtosis). All variables

coded in the lithic analysis as interval scale data were then subjected to the Frequencies procedure. The example below (see Appendix D, Table D-23) shows a typical printout of a Frequencies procedure conducted on the variable: marginal retouch scars on side 1. This variable measures the number of marginally retouched flake scars (see variable definations above) occurring on side 1 of all items classified as bifaces during the laboratory analysis phase. Table D-23 is a simplified data evaluation.

The column of numbers under the word CODE represents the number of bifaces which exhibit the frequency of marginal flake scars shown in the column under the word FREQ. That is to say, there are two bifaces recovered from the Truman field operations which exhibit 19 marginal retouched flake scars on side 1. Conversely, 19 bifaces have only one marginal retouched flake scar on the same side. The zero value represents the number of broken bifaces recovered during the field survey which could not be analyzed and will be omitted from the analysis. Also illustrated in Table D-23, is the division of the continuous distribution (1 thru 44) into four discrete categories. Upon close inspection of the first two columns (code & frequency), logical distinctions may be drawn from the distributional qualities of each category. For example, Group 1 is characterized by a few artifacts which have between 19 and 20 flake scars on side 1. Group 2 is characterized by an increased number of artifacts (4 thru 9) having a significantly higher frequency of flake scars (19 to 27) occurring on side 1, and so on. What is emphasized in these categories are similarities within each group. Of course, there will always be some overlap between groups, but these should be minimized by the use of appropriate statistics. The computer was then used to recode the data shown in Table D-23 into the four categories.

With the data coded in this fashion, it was possible to begin the discriminant function analysis. This particular technique was selected for its robustness and explanatory power in studying the numerical relationships between variables. Nie et al. (1975:1-10) best summarize this procedure in the statistical package for the Social Sciences (SPSS) handbook:

> With discriminant analysis a researcher calculates the effects of a collection of interval level independent variables on a nominal dependent variable (classification). Linear combinations of independent variables that best distinguish between cases in the categories of the dependent variable are found.

SPSS subprogram DISCRIMINANT calculates and prints discriminant-function coefficients and classification-function coefficients. All independent variables may be entered into the discriminant functions, or, if the user chooses, DISCRIMINANT will operate in a stepwise mode, entering variables in the order of their explanatory power. The user may control both the number of discriminant functions generated and the number of variables entered.

Discriminant scores, which are the probability of membership of the dependent variable in each category, may be calculated and printed for each case. In addition, these scores may be placed on an output file and reentered into SPSS on a subsequent run for further analysis. In using discriminant function as a classifica-

tory device, several available options were judged appropriate for these data. First, the stepwise method of selecting variables in an hierarchical fashion according to their discriminating powers, was used. Klecka (1975:447) describes this option.

> The process begins by choosing the single variable which has the highest value on the selection criterion. This initial variable is then paired with each of the other available variables, one at a time, and the selection criterion is computed. The new variable which in conjunction with the initial variable produces the best criterion value is selected as the second variable to enter the equation. These two are then combined with each of the remaining variables, one at a time, to form triplets in which the best criterion value determines the third variable to be selected. This procedure of locating the next variable that would yield the best criterion score, given the variables already selected, continues until all variables are selected or no additional variables provide a minimum level of improvement.

The stepwise procedure has flexibility in the way variables are discriminated against. For this analysis, Rao's V or generalized distance measured was utilized. Simply stated, this method emphasized "the greatest overall separation of the groups" (Klecka 1975:448). It was believed that by using this method, the results would be more interpretable in terms of the groupings. It should be noted here, that several runs of the discriminant function analysis failed to provide optimal solutions. This, in many cases, was caused by two variables which recorded the same information but on different sides of an artifact. In these instances, a new variable was computed which combined the values of the two original variables.

In summary, the discriminant function analysis was used to produce an optimal set of discriminating variables for a particular group. These variables are arranged in descending order of importance with respect to their overall ability to discriminate between groups. It is this hierarchical structuring of variables that provided the necessary information for a breakdown analysis of the data.

The breakdown test was structured according to the optimal solution of variables for discerning groups found in the discriminant function analysis. The added advantage of the breakdown test however, is its capability of displaying the underlying distributions of each group as it is influenced by the various independent variables. Observation of each subgroup's sum, mean, standard deviation and variance allows the researcher to quantatively assess the relative importance of each variable's contribution to the overall classification scheme. The dendrograms, illustrated below summarize the information derived from the breakdown analysis.

## CLASSIFICATION RESULTS

### Debitage

Analysis of the manufacturing debris of lithic technologies can provide a basis for evaluating differences in the kinds of logistical, in a literal sense, decisions a hunter-gatherer group must make in articulating a technological system

with different mobility strategies. The strategies for lithic procurement and gear replenishment can vary with the demands a particular kind of environment places on the overall subsistence-settlement system. These strategies are generally organized in stages which are separated from one another in space and time. What is an appropriate sequence of manufacturing stages under one kind of adaptive strategy may be completely ineffective given another strategy which must respond to a different environmental structure. If the prehistoric hunter-gatherers who inhabited this area were using the grasslands and the forest differently, then this should be reflected in the character of debitage in these two environments.

Intuitively, it would seem that characteristics of the striking platform of flakes should be particularly informative in this regard since the platform contains the most telling information concerning the kinds of cores from which particular flakes are derived. This is especially true of platform width, which is measured parallel to the plane of maximum flake width and generally constitutes the long axis of the platform. Large platform widths indicate flake production strategies directed toward deriving larger flakes. This is generally accomplished by use of expedient cores. Small platform widths, in turn, are indicative of reduction strategies which produce large amounts of waste flakes and would suggest biface or discoid core reduction. Platform width will also decrease with reduced biface core area. Thus, smaller platform widths can also indicate differences in the reduction stage of a single flake production strategy. Debris outputs from the logistical component of a hunger-gatherer system should be associated with the more portable core types such as bifaces and discoids, since logistical planning must generally deal with an artificial sense of raw material scarcity. This scarcity also places demands on the conservation of bifaces resulting in more intensive reduction sequences of this core type. Ultimately, this should result in the production of flakes from increasingly reduced bifaces in logistically organized technologies, which also implies reduced flake size.

Gear chosen for a logistical trip is selected to be responsive to a narrow set of purposes involved in the specialized exploitation of generally one kind of resource. Transport costs mitigate against carrying quantities of gear that would be responsive to every event that might occur during a trip. Planning must be primarily concerned with the specific requirements of a narrow range of procurement demands. The biface is one means to increase the responsive potential of an otherwise specialized collection of gear, because, as noted earlier, it can be used for many purposes and can still provide a source of raw material to respond to some of the unanticipated as well as anticipated events encountered during a logistical foray. Because of the conditions of "scarcity" imposed by logistical deployment, though, alternative options in the manner in which the available technology can be used is limited in comparison to the options available at a residence. Thus, in the absence of raw material options in the immediate environment, tasks which might be performed more effectively with a certain kind of tool or a larger flake, might be performed with a smaller flake derived from a biface or discoid core, or the core itself on a logistical trip. Therefore, we should look for simplicity, specificity and conservation principles in lithic assemblages dominated by logistical strategies and complexity, multi-purpose use and less constraint on the use of raw material in residential strategies.

To return to the issue of debitage, then, we might expect a classification based on platform width to provide a meaningful index for differentiating between logistical and residential strategies. Other variables such as platform thickness, flake size, flake width, or flake thickness might also be expected to inform differentially on this issue. To examine the relationship between platform width and other debitage variables, a discriminant function analysis (see Klecka 1975) was performed. Variables included flake orientation, reduction type, platform type, flake length, flake thickness, platform thickness, platform angle, number of dorsal scars, flake area, platform width to platform thickness ratio, flake length to width ratio and platform width to flake width ratio (see Figure E-6 for a description of these variables). These variables were ordered in terms of the amount of variation that was explained in relation to platform width. Stepwise variable selection resulted in an ordered sequence beginning with platform thickness. In descending order, the other variables were platform width/platform thickness ratio, flake width, flake thickness, platform orientation, reduction type, platform angle flake area, flake length/width ratio, platform width/flake width ratio and length. Continuous measurements were grouped into ordinal variables for the discriminant analysis. The intervals used to ordinate these variables are listed in Table D-24.

Scatter plots (see Figures E-7 and E-8 of the four ordinated groups of platform width suggest that this variable is a fairly good discriminator of the variation contained in the debitage variables we selected for measurement as a whole. In fact, there seems to be a rather direct linear relationship between the group centeroids as is illustrated in Figure E-7. This means that all variables related to size are positively correlated with platform width. As this latter variable increases so do the size values of the other variables.

Using platform width as the discriminating variable produced a classification of individual cases which was 68.47 percent accurate (see Table D-25). As discussed in the methodology section, classification with discriminant functions is accomplished by the calculation of classification coefficients derived from pooled within-groups covariance matrices and the centroids for the discriminating variable(s) (see Klecka 1975:445). These coefficients measure the probability of group membership for each case. This means that platform width could not singly account for all the variation in debitage in only 31.53 percent of the cases. The highest correct classification (78.1 percent) is found in the smallest platform width (rank 1) and the least classification success is found in the rank 3 group. The greatest degree of success is derived from the largest (4) and smallest (1) groups of platform width which is also evident from the combined group scatterplot (see Figure E-7). These results should be anticipated when continuous variables are segmented into discrete groups for ordination. Intermediate groups will almost always exhibit the most overlap.

To increase the accuracy of our classification, then, we ran an SPSS Breakdown program (see Nie et al. 1975:249-266) for platform width against the five most important variables of the stepwise discriminant function analysis. This program allows one to observe the distribution of the mean and standard deviation of a variable across a hiearchically arranged dendrogram of other variables. The output from this program allowed us to observe some of the variation in platform width as it relates to the most significant independent variables defined in the discriminant analysis. With this display, then, we were able to group debitage more

accurately into modal platform widths. Figures E-9, E-10, E-11 and E-12 illustrate the dendrogram derived from the Breakdown program and the boundaries that were determined as a result of identifying modal tendencies in platform width means. Six debitage classes resulted from this analysis. Representations of their actual areal and platform size ranges are illustrated in Figure E-13. Class 1 sizes indicate a category of very small flakes which can be derived from a number of manufacturing processes or resharpening. Class 2 represents a range of flakes that can be characterized as primarily biface thinning flakes. The higher classes appear to represent large biface thinning flakes and flakes produced from expedient cores. These classes will serve as our final classification and we will now observe their distributions across the environmental aggregates defined previously.

Class membership of cases was determined by tracing the dendrogram pathways for each class on breakdown outputs for each stratum. Table D-26 reports the distribution of the various flake classes by aggregate. Data from aggregates 1, 2, 7 and 8 are the most reliable for comparative purposes because of the large frequencies. Aggregate 1, as discussed previously, represents a fully forested environment while aggregates 7 and 8 are dominated by grasslands. Aggregate 2 represents data derived from excavation units within a rockshelter. A graph of the relative proportions of debitage classes (see Figure E-14) reveals that our projected expectations for the patterned use of these different environments is supported. In both aggregates 7 and 8 the relative proportions of smaller flake classes exceed those from aggregate 1; the opposite relationship holds for the larger flake classes. In the case of aggregate 8, the relative proportions of flake class 2, which is considered an essentially pure biface thinning flake grouping, in particular, significantly exceed that of aggregate 1. A difference of proportions test on the proportions of class 2 debitage in the two strata (Blalock 1972:228-230) produces a Z value of 12.91, which is significant at the .001 level. Therefore, class 2 is significantly underrepresented in aggregate 1 compared with aggregate 8. Interestingly, the debitage from the rockshelter produces a curve similar to that of aggregate 8. This leads us to suggest that this rockshelter may have been utilized in a logistical manner if our assumptions about the meaning of these flake classes is correct.

In conclusion, it can be said that the data from manufacturing debris is consistent with our expectations concerning the implications of lithic raw material manufacturing staging under conditions of high logistical and high residential mobility. Smaller debitage classes are more heavily represented in aggregate 1. This would support the contention that logistical mobility was more strongly emphasized in the grasslands.

### Flake Tools

The extremely variable morphologies of flake tools (see Plates 1 and 2) tend to defy the detection of significant variation using a discriminant analysis format. Therefore, as was the case when we examined bifaces, single attribute analysis was preferred in displaying and discussing data on this artifact class. Expectations generated previously suggest that the emphasis on economizing technological principles in collector strategies will result in the utilization of smaller and, at times, less appropriate flakes to perform tasks. To examine this proposition in the framework of our study, maximum thickness was selected since it should provide


Scale: Actual Size

a. 23SR1016
b. 23SR1016
c. 23HE867
d. 23SR1016
e. 23SR1016
f. 23SR1016
g. 23SR1016
h. 23BE1036
i. 23SR1016
j. 23SR1016
k. 23SR1024

PLATE 1

**FLAKE TOOLS**

HARRY S. TRUMAN RESERVOIR-OSAGE RIVER BASIN

U.S. ARMY ENGINEER DISTRICT-KANSAS CITY, MISSOURI


a. 23BE1036
b. 23HI484
c. 23SR1016
d. 23HI484
e. 23HI484
f. 23SR1018
g. 23HI484
h. 23BE1038

Scale: Actual Size

PLATE 2

**FLAKE TOOLS**

HARRY S. TRUMAN RESERVOIR-OSAGE RIVER BASIN

U.S. ARMY ENGINEER DISTRICT-KANSAS CITY, MISSOURI

the most complete information on conservation and reduction strategies as they relate to flake production.

Table 8 presents means and standard deviations for the variable maximum thickness for the flake tool assemblages of strata 1, 4, 14, 16, 23 and 24. Initially, it can be seen that stratum 23, which can be considered the purest prairie setting, exhibits an assemblage of decidedly thinner and less variable (as indicated by the low standard deviation) flake tools than those of the other strata. The differences between means is not great and a statistical procedure to evaluate the magnitude of these differences was deemed necessary. Again, a two sample difference of means test (see Blalock 1972:219-228) was selected for this purpose.

**TABLE 8**

**SUMMARY STATISTICS FOR FLAKE TOOL MAXIMUM THICKNESS**

| Stratum | | n | x | s |
|---|---|---|---|---|
| 1 | (Pomme de Terre) | 289 | 8.13mm | 7.37mm |
| 4 | (Rock Shelter) | 101 | 8.17mm | 6.15mm |
| 14 | (Tebo Creek) | 16 | 8.00mm | 6.80mm |
| 16 | (Tebo Creek) | 90 | 6.67mm | 4.47mm |
| 23 | (Middle South Grand) | 51 | 6.02mm | 3.53mm |
| 24 | (Upper Osage) | 391 | 9.02mm | 7.35mm |

A comparison of stratum 1 with stratum 23 indicates that the latter sample is significantly smaller at the .025 level (t=2.00) for a one-tailed test. Strata 1, 4, 14 and 24 were not significantly different. Somewhat of a surprise was the fact that stratum 24 constitutes the largest mean thickness for assemblages, but it does not statistically differ from the stratum 1 assemblage (t=1.56, p=.05) at the .05 level of significance. This indicates that a good deal of large flake manufacture was occurring in this area, most probably in the extreme eastern portion of the stratum, near or at the forest edge. If stratum 24 had been divided into smaller strata such as the Tebo Creek Aggregate was, similar differences as those found between strata 14 and 16 (see Table 8) would probably be distinguishable. As was the case in biface patterning, stratum 16 reflects greater emphasis on economizing technological strategies. Flake tools from stratum 16 are also significantly smaller than those from stratum 1 at the .05 level (t=1.78) for a one-tailed test.

Another factor which may come into play in the operation of collector versus forager strategies is the intensity of use. It has been argued that conservation of raw material in the operation of a lithic technology is most pronounced in collector systems. This is true of personal gear which is highly maintained for re-use in a number of settings, but this may not be true for situational gear. We have seen that there appears to be a tendency to make do with smaller flake tools in the prairie areas, but what if we consider factors which effect the amount of work a flake tool will accomplish before it is discarded? Here the costs of transport begin to influence other conservation principles and we might expect a lesser tendency for collectors to extend the use-life of situational gear past a single use to minimize transport costs.

To evaluate this rationale two variables were examined: total utilized edges and retouch. Retouch is generally applied to tools to extend their use-lives; the total number of edges used is a rough indication of the intensity of use a particular flake tool will undergo before it is discarded. Comparisons of the average number of edges used per flake tool for the various environmental zones are displayed in Table 9. As expected the greatest intensity of use occurs in the assemblage from the forested zone of stratum 1. Stratum 23, again, exhibits the greatest contrast to the latter. Difference of means tests indicate that the samples from the three prairie strata (16, 23, 24) are used significantly less than flake tools from stratum 1 (stratum 23 vs. stratum 1: $t=2.44$, $p=.01$; stratum 24 vs. stratum 1: $t=1.95$, $p=.05$).

**TABLE 9**

**TOTAL EDGES UTILIZED PER FLAKE TOOL**

| Stratum | x | s |
|---|---|---|
| 1 | 1.571 | .787 |
| 4 | 1.446 | .768 |
| 14 | 1.25 | .683 |
| 16 | 1.385 | .628 |
| 23 | 1.31 | .510 |
| 24 | 1.463 | .673 |

An examination of retouch produces similar results (see Table 10). Here, stratum 1 exhibits a larger proportion of retouched flake tools than any other stratum, exceeding the next highest by 10 percent. Applying a differences of proportions test (see Blalock 1972:230-232) indicates that stratum 24 is significantly lower in proportion of retouched tools ($z=3.50$, $p=.0005$ for one-tailed test). Stratum 23 is not as clearly separated from stratum 1 ($z=1.43$, $p=.100$ for one-tailed test) statistically, but it is much closer to the stratum 24 pattern than to the forested example.

**TABLE 10**

**PROPORTION OF FLAKE TOOLS EXHIBITING RETOUCH TO TOTAL FLAKE TOOLS**

| Strata | Fraction | Proportion |
|---|---|---|
| 1 | 118/305 | .39 |
| 14 | 4/16 | .25 |
| 16 | 26/91 | .29 |
| 23 | 15/51 | .29 |
| 24 | 97/395 | .25 |

## Summary

The foregoing analysis has attempted to approach the problem of differential adaptive strategies from a technological perspective. The results of the analysis indicate that economizing principles of technological organization may be useful

for examining differences between collector and forager strategies. Certainly it has been shown that the prairie and forest do exhibit patterned differences in the structure and diversity of lithic assemblages. These differences were shown to occur even in less than ideal circumstances, and the distinguishing aspects of this analysis should be even more effective through detailed, site-by-site settlement pattern studies in the future.

**Projectile Points**

The projectile point analysis is presented in two sections. The first section treats the assemblage as a whole, examining it statistically without regard for temporal or cultural associations. Differences between aggregates are examined with respect to artifact measurements and breakage patterns.

The second section examines the projectile points within a cultural-historical framework of known types. The survey assemblage is compared to assemblages recovered by others working in the Harry S. Truman Reservoir area. These include the University of Missouri's survey results (Roper and Piantkowski 1977; Goldberg and Roper 1981), Illinois State Museum's work at Rodgers Shelter (Kay 1978), as well as several other more general sources. Roper and Piontkowski in their analysis of projectile points recovered during 1975 and 1976, and possibly earlier, note that typing projectile points is often difficult, however, type descriptions should be concise: "Unfortunately, this is rarely true for projectile point classifications, and southwestern Missouri is no exception. Identification is far more intuitive (1977: 215)." Most points in this analysis are identified by name. More recently, however, Goldberg and Roper (1981) in the analysis of projectile points recovered from survey, testing, and excavation during 1977 through 1979, use a "Category" approach. Rather than using a type name, points are assigned to a numbered category or group. This approach was used by Chapman (1956) and Wood (1961) in the survey of the Pomme de Terre Reservoir area. It was later applied to Rodgers Shelter points by Ahler (1971) and Kay (1978). Categories or groups were also used by Chomko (1976, 1977) in his analysis of Truman projectile points. Since the major identifier is not a type name, but a category with an associated type name, comparisons are time consuming and involve much searching. However, since the category approach is generally used in the region, it has been retained here. Categories are the same as those used by Goldberg and Roper (1981) with the exception of the 400 series, new or different types. Donna C. Roper examined the survey projectile points and identified them by known cultural-historical types. These types are reported by category in Section II.

Analysis of the Projectile Point Assemblage: a total of 213 projectile points were recovered during the Truman Survey. Of these, only 48 or 22.5 percent (Table 11) were complete. Statistics and distributions for the entire population were examined in order to recode continuous variables (metric measurements) into ordinal scale variables as well as to assess the potential for between stratum comparisons.

All of the projectile points were manufactured from locally occurring cherts (Table 12). As an entity, Chouteau chert is most common, comprising one quarter of the assemblage, followed by 22.5 percent of the points made from Burlington chert. However, when all of the various Jefferson City types are combined, this

TABLE 11

PROJECTILE POINT BREAKAGE PATTERNS

| Break Type | Count | Percent |
|---|---|---|
| Undetermined | 21 | 9.9 |
| Whole | 48 | 22.5 |
| Tip | 7 | 3.3 |
| Midsection | 14 | 6.6 |
| Base | 17 | 8.0 |
| Lateral Section | 12 | 5.6 |
| Ear or Shoulder | 12 | 5.6 |
| Tip Missing | 59 | 27.7 |
| Blade Missing | 14 | 6.6 |
| Base Missing | 9 | 4.2 |

TABLE 12

LITHIC MATERIAL DISTRIBUTIONS OF PROJECTILE POINTS

| Chert Type | Count | Percent |
|---|---|---|
| Jefferson City Banded | 14 | 6.6 |
| Jefferson City Mottled | 39 | 18.3 |
| Jefferson City Oolitic | 26 | 12.2 |
| Burlington | 48 | 22.5 |
| Chouteau | 55 | 25.8 |
| Undetermined Jefferson City | 19 | 8.9 |
| Undetermined | 12 | 5.6 |

group is clearly dominant, comprising 46 percent of the assemblage. Previous work in the region (e.g. Klippel 1971, Chomko 1976, 1977, Goldberg and Roper 1981, Novick and Cantley 1977, Roper and Piontkowski 1977) has demonstrated that most chipped tools are made from local cherts.

Examination of point breakage patterns reveals that bases are the most frequently occurring fragment. Bases include whole specimens, all fragments classified as "bases" and "tip missing", as well as possible specimens in other categories. At least 50 percent of the assemblage included bases and basal fragments, consequently, attributes selected for examination in the analysis focused on this portion of the projectile point. While axial length is often used as a defining criterion for assignments of specimens to cultural-historical types, only 22.5 percent of the specimens collected during the survey were complete. Therefore less than one quarter of the total point population would have been incorporated into such an analysis based on axial length. The variety of breakage patterns suggests that many of these tools functioned for a variety of tasks, as proposed by Ahler (1971) and others. Many of these tools were no doubt curated (Binford 1977), as suggested by blade reworking (Tables 12 and 13) on the majority of specimens. The presence of beveling and steep retouch, which are indicative of later life history stages, supports the suggestion of tool curation. In general, these edge treatments are not common in the region, consequently, a figure of 15 percent of the total assemblage exhibiting beveling or steep retouch is unexpected.

Metric data was recoded into groups for all variables. Axial length was recoded into five groups (Table D-27). Sixty-five percent had no recorded axial length and were excluded from calculation of a mean. The mean axial length for 74 specimens is 35.8mm. A summary of metric data on some of the more commonly reported projectile point types in the region (e.g. Chapman 1962, 1975, 1980; Chomko 1976, 1977; Novick and Cantley 1977; Kay 1978; Roper and Piontkowski 1977; Goldberg and Roper 1981) is presented in Table D-28. This average falls at the maximum range for the small Woodland/Mississippian points and approaches the minimum for the Late Archaic types. Many of the Late Archaic types, as Chapman (1975, 1980) and Marshall (1957) argue, may well extend much later in time, into Late Woodland and perhaps Mississippian periods. In fact, securing a well documented projectile point sequence is recognized as one of the major goals in the area (Goldberg and Roper 1981).

Mean tang length is 13.0mm, while mean blade length is 25.3mm (Table D-27). The tang to blade ratio is 1:2.14. While such a summary ratio is not available in Chapman's work (1980, Appendix III), an examination of projectile point illustrations suggests that the ratio would certainly be greater than 1:1.

Examination of width measurements on the survey projectile point assemblage (Table D-29), places the points with earlier, Late Archaic types (Table D-28). Maximum thickness for the survey assemblage is 7.4mm, while 2mm is expected generally for later cultural periods. In most instances, with the exception of some excurvate blades, shoulder width is the maximum width. The assemblage mean is about 29mm. Again, this is clarly within the larger, Late Archaic point roups (Table D-28). As expected, width halfway up the blade has a mean of 16.7mm, indicating that the blades become narrower, generally reflecting their trianguloid shape, and trend toward straight or incurvate blades. Basal width is slightly greater than tang

## TABLE 13

## PROJECTILE POINT ASSEMBLAGE COMBINATION BREAKS

| Type | Count | Percent |
|---|---|---|
| Undetermined | 151 | 70.9 |
| Basal Ear Missing | 11 | 5.2 |
| Shoulder Ear Missing | 24 | 11.3 |
| Combination Shoulder/Base | 17 | 8.0 |
| Tip Missing | 3 | 1.4 |

## TABLE 14

## TYPES OF PROJECTILE POINT BLADE REWORKING

| Side 1 | | | Side 2 | | |
|---|---|---|---|---|---|
| Type | Count | Percent | Type | Count | Percent |
| Undertermined | 43 | 20.2 | Undetermined | 52 | 24.4 |
| Absent | 3 | 1.4 | Absent | 5 | 2.3 |
| Opposite Beveling | 12 | 5.6 | Opposite Bevel | 9 | 4.2 |
| Alternate Bevel | 9 | 4.2 | Alternate Bevel | 10 | 4.7 |
| Even Bifacial | 134 | 62.9 | Even Bifacial | 126 | 59.2 |
| Steep Unilateral | 12 | 5.6 | Steep Unilateral | 8 | 3.8 |
| | | | Notch | 3 | 1.4 |

width, 16.2mm and 14.5mm, respectively. This relationship demonstrates a slightly expanding basal tang.

Angles at projectile point junctures, cluster between 49° and 50.8° (Table D-27). Recording these measurements is not very common in many analyses, consequently there is little with which to compare them.

Projectile point distributions within the strata range from a low of one per stratum, to a high of 85 (Table D-30). Of the 24 strata only 12, or half, included projectile points. These twelve strata may then be combined into groups related to drainage basins. The largest distributions are found in the Middle South Grand, the Pomme de Terre, the Upper Osage, the Lower Osage and lesser amounts for the others. Stratum four, the material recovered from the test excavations at the rock shelter, are separated simply because they represent a different collection strategy.

As noted above, as a result of breakage patterns, attention focused on the basal portion of projectile points within strata. These attributes include maximum thickness, thickness half way up the blade, shoulder width, and basal width (Table D-31). The greatest range of measurements, in all cases, is within the groups having the largest population size (N = 85, 53, and 36). Mean thickness ranges from 5.0mm to 10mm. Five of the twelve (41.7 percent) are below the point assemblage mean of 7.4. Four of these are close, however, while the 5.0mm mean is much lower. By graphing distributions for all four variables, comparisons are facilitated (Figure E-15). For example, mean thickness is most homogeneous, occurring as the most nearly straight line, between strata. Thickness half way up the blade could not be calculated for four strata (2, 8, 9, and 12), therefore the means range from 0 to 8.5mm. If the zero values were excluded, the range would be from 4.0 to 8.5mm or 4.5; about equal to the maximum thickness ranges the assemblage mean is 6.7mm with only strata 11 and 20 being lower. The most similar strata with respect to mean thickness and mean thickness half way up the blade are 1, 16, 20, 23, 24, again, generally those with high counts. Shoulder width has the greatest range from 0 to 92mm, or 7 to 92mm if zero is excluded. Basal width ranges from 0 to 64mm or 8 to 64mm in stratum 23, again, that with the highest count.

By examining the relationships of these four variables in Figure E-15, a progression from smallest to largest (shoulder width is greater than basal width, which is greater than maximum thickness, which exceeds thickness half way up the blade) may be observed. Strata exhibiting this similarity include 1, 3, 11, 12, and 24 with the former two and the latter being most similar. In summary, metric data on projectile points between drainages indicates that those within the Pomme de Terre and Upper Osage drainages are most similar. Overall measurements of projectile points have greatest affinities to those representative of Late Archaic, and probably later cultural periods.

Description of the Projectile Points: as was noted above in the introduction to this portion of the analysis, in this section the projectile points that were recovered during the survey will be described according to the format employed by Goldberg and Roper (1981) (see Table D-32). The samples described here will also be compared to the samples recovered by other investigators. All measurements below are presented in millimeters (mm).

**Category 384 Hardaway Side-Notched (n=1) (Plate 3C)**

The Hardaway side-notched point was described by Coe (1964:67) from excavations at the Fall Line of North Carolina as "A small, broad, thin blade with narrow side-notches and a recurved, concave base." One broken specimen was recovered during the present survey and it measured:

| Tang Length | Shoulder Width | Tang Width | Basal Width | Maximum Thickness |
|---|---|---|---|---|
| 14.00 | 28.00 | 21.00 | 26.00 | 8.00 |

Goldberg and Roper (1981:16) analyzed two broken specimens:

| Haft Length | Basal Width | Thickness |
|---|---|---|
| 12 and 14 | 25 and 26 | 7 and 8 |

Coe's (1964:67) original summary measurements include:

| | Length | Width | Thickness |
|---|---|---|---|
| Mean | 35 | 25 | 4 |
| Range | 28-50 | 23-35 | 3-6 |

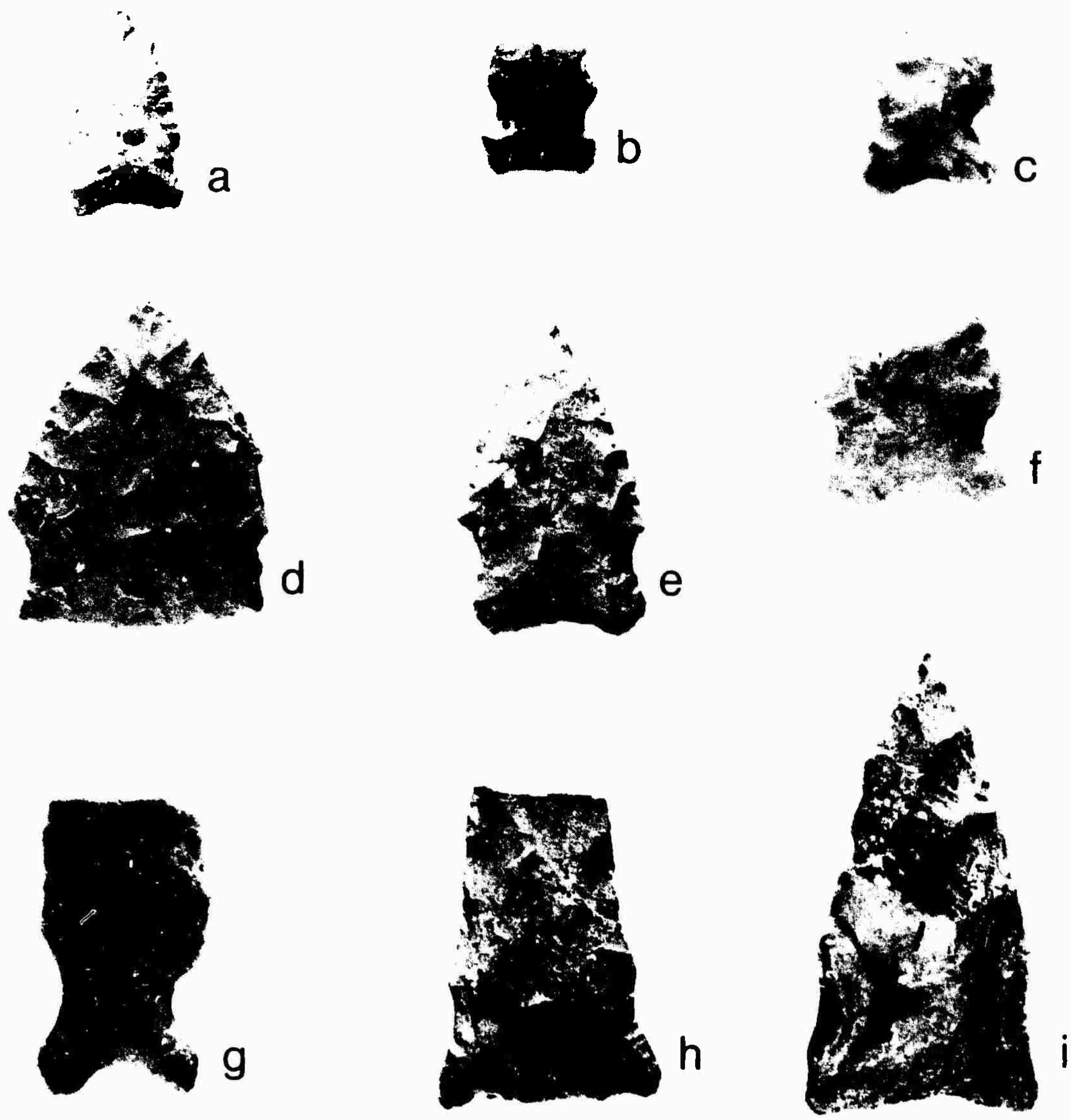
**Category 378 Big Sandy (n=1) Plate 3b**

Only one broken Big Sandy projectile point was recovered during the survey. The point was first described by Kneberg (1956) from excavations at the type site in Henry County, Tennessee. Bell (1960:8) describes its distribution as west-central Tennessee, Kentucky and northern Alabama. Goldberg and Roper (n.d.) describe the type as having excurvate blade edges, well defined sholuders, notches, and a concave, square base. The broken specimen recovered during the present survey measured:

| Tang Length | Tang Width | Basal Width | Maximum Thickness |
|---|---|---|---|
| 12.00 | 12.00 | 20.0 | 6.00 |

Goldberg and Roper's (1981:19) sample of eight points measured:

| | Length | Width | Haft Length | Basal Width | Thickness |
|---|---|---|---|---|---|
| Count | 1 | 4 | 7 | 6 | 7 |
| Mean | - | 23.5 | 14.4 | 19.8 | 8.1 |
| S | - | 1.7 | 1.6 | 2.4 | .7 |
| Range | 38 | 22-25 | 13-17 | 16-22 | 7-9 |




a. CATEGORY 388, 23SR1030
b. CATEGORY 388, 23SR1001
c. BIG SANDY, CATEGORY 378, 23SR1011
d. HARDAWAY, CATEGORY 384, 23BT58
e. CATEGORY 404, 23SR997
f. CATEGORY 404, 23SR1012
g. CATEGORY 405, 23SR997
h. RICE SIDE-NOTCHED CATEGORY 325, 23HI484
i. RICE SIDE-NOTCHED, CATEGORY 325, 23BE1020

Scale: Actual Size

PLATE 3
**SIDE-NOTCHED HAFTED BIFACES**
HARRY S. TRUMAN RESERVOIR-OSAGE RIVER BASIN
U.S. ARMY ENGINEER DISTRICT-KANSAS CITY, MISSOURI

Roper and Piontkowski (1977:240-248) analyzed three Big Sandy points having the following measurements:

| | Shoulder Width | Haft Length | Base Width | Thickness |
|---|---|---|---|---|
| Count | 3 | 3 | 3 | 3 |
| Mean | 24 | 14 | 26 | 24 |
| Range | 22-25 | 14-15 | 23-28 | 22-25 |

**Category 368 Small Triangular Bladed, Side-notched Darts (n=3)**

These have excuvate blades, sharp shoulders, deep notches and concave, expanding bases. The sample from the present survey measured:

| | Length | | | Width | | | Maximum |
|---|---|---|---|---|---|---|---|
| | Axial | Blade | Tang | Shoulder | Tang | Basal | Thickness |
| Count | - | - | 2 | 1 | 2 | 2 | 2 |
| Mean | - | - | 9.50 | 16.0 | 13.0 | 17.50 | 5.0 |
| S | - | - | 2.12 | - | 0.0 | 0.71 | 1.41 |

Goldberg and Roper's (1981:20) sample measured:

| | Length | Width | Haft Length | Basal Width | Thickness |
|---|---|---|---|---|---|
| Count | 1 | 3 | 7 | 1 | 9 |
| Mean | - | 16.3 | 10.1 | - | 5.7 |
| S | - | .6 | 1.2 | - | .5 |
| Range | 22 | 16-17 | 8-11 | 12 | 5-7 |

**Category 325 Rice Side-Notched (n=12) (Plate 3e, f)**

The Rice Side-Notched was defined by Bray (1956) at the Rice Site 23SN200. Goldberg and Roper (1981) have classified these within their side-notched grouping. These points are characterized by broad expanding stems, straight bases, shallow notches, weakly defined shoulders, and a large triangular blade. Blade edges are sometimes beveled.

Survey sample:

| | Length | | | Width | | | Maximum |
|---|---|---|---|---|---|---|---|
| | Axial | Blade | Tang | Shoulder | Tang | Basal | Thickness |
| Count | 5 | 5 | 9 | 7 | 9 | 9 | 11 |
| Mean | 52.2 | 37.4 | 15.78 | 25.29 | 23.66 | 27.44 | 8.00 |
| S | 10.06 | 10.40 | 2.44 | 2.81 | 4.09 | 4.77 | 1.00 |

Goldberg and Roper's (1981:26-27) sample:

| | Length | Width | Thickness | Haft Length | Basal |
|---|---|---|---|---|---|
| Count | 18 | 54 | 71 | 6.8 | 50 |
| Mean | -5.0 | 28.8 | 8.6 | 18.3 | 26.0 |
| S | 9.5 | 3.7 | 1.6 | 3.7 | 3.6 |
| Range | 39-73 | 23-40 | 6-11 | 10-30 | 18.34 |

Kay (1978:8-116-118, Figure 8-34) included the Rice Side Notched points recovered from Rodgers Shelter as "nearly unique forms." Measurements include:

| | Length | Width | Thickness |
|---|---|---|---|
| Range | 43-89 | 21-35 | 6-20 |

Roper and Piontkowski (1977:231-232) report on a sample of 41 points. Their statistics are:

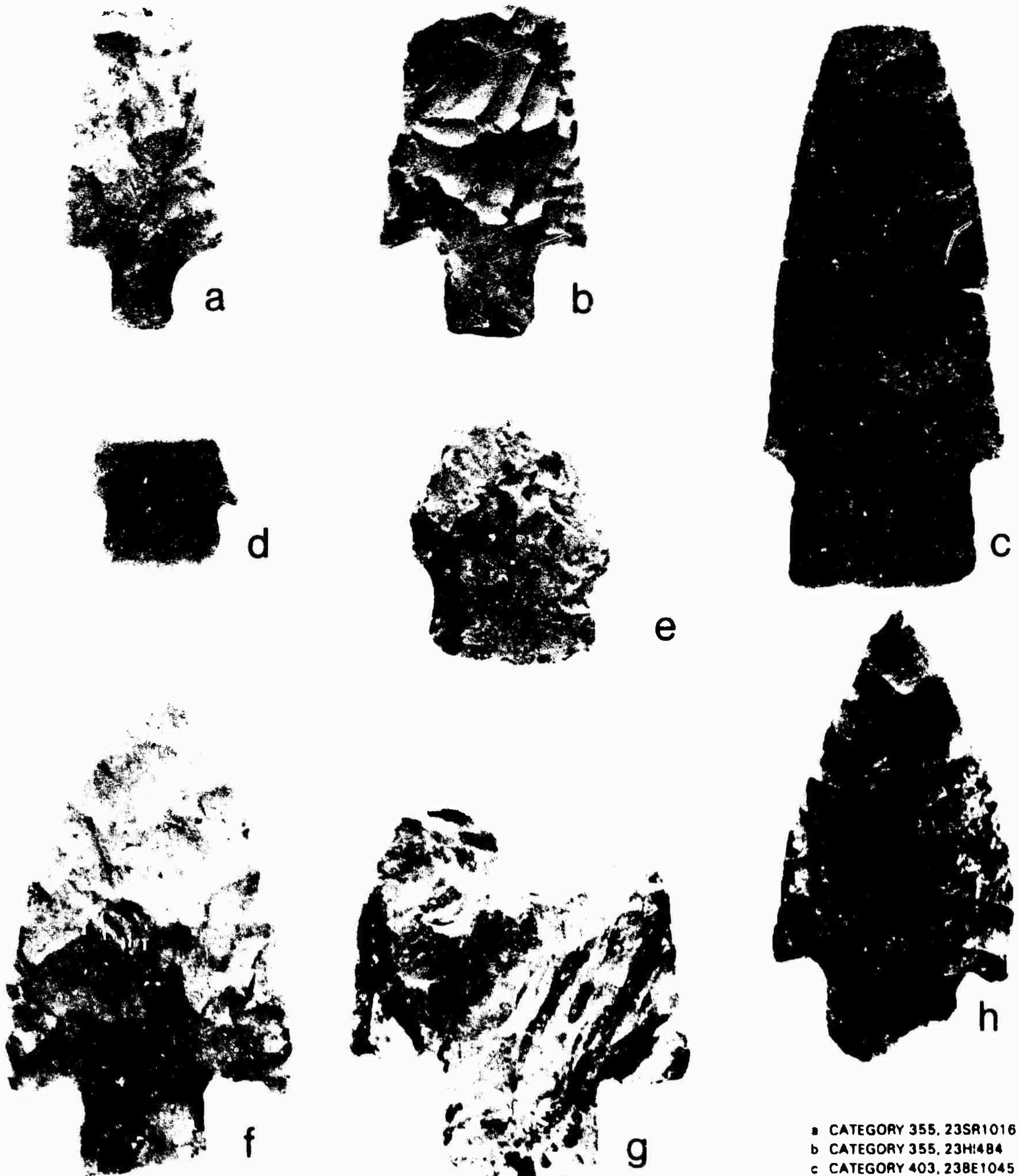
| | Length | Width | Thickness | Haft Length | Basal Width |
|---|---|---|---|---|---|
| Count | 6 | 39 | 41 | 41 | 41 |
| Mean | 56.7 | 28.3 | 8.8 | 19.3 | 27.6 |
| Range | 45-66 | 22-36 | 7-15 | 14-28 | 22-32 |

**Category 339 Etley Variant A - (n=6) (Plate 4)**

Goldberg and Roper (1981:40-41) have classified this type within their straight stemmed category. Their sample included 51 points. Etleys are broad, thick, triangularly bladed points with moderate shoulder barbs, straight stems and bases. Bell (1960:36) observed that these were unusually long points with relatively small bases compared to blade lengths.

Survey sample:

| | Length | | | Width | | | Maximum |
|---|---|---|---|---|---|---|---|
| | Axial | Blade | Tang | Shoulder | Tang | Basal | Thickness |
| Count | 1 | 2 | 5 | 3 | 6 | 5 | 6 |
| Mean | 66.0 | 55.5 | 14.60 | 39.33 | 21.17 | 21.80 | 10.33 |
| S | - | 4.95 | 2.07 | 4.16 | 1.33 | 1.64 | 1.37 |




a CATEGORY 355, 23SR1016
b CATEGORY 355, 23HI484
c CATEGORY 403, 23BE1045
d CATEGORY 362, 23SR1011
e CATEGORY 362, 23SR997
f. CATEGORY 339, ETLEY, 23HI484
g. CATEGORY 339, ETLEY, 23HI484
h. CATEGORY 339, ETLEY, 23HE865

Scale: Actual Size

**PLATE 4**
**STRAIGHT STEMMED PROJECTILE POINTS**
HARRY S. TRUMAN RESERVOIR-OSAGE RIVER BASIN
U.S. ARMY ENGINEER DISTRICT-KANSAS CITY, MISSOURI

Specimens measured by Goldberg and Roper (1981:40):

| | Length | Width | Thickness | Haft Length | Basal Width |
|---|---|---|---|---|---|
| Count | 6 | 30 | 51 | 45 | 34 |
| Mean | 77.7 | 40.2 | 10.1 | 16.2 | 22.5 |
| S | 14.8 | 5.0 | 1.4 | 2.4 | 3.2 |
| Range | 54-94 | 31-52 | 7-14 | 11-12 | 17-39 |

Roper and Piontkowski (1977:225-226) report on a sample of 16 points recovered during the earlier years of the University of Missouri's most recent work in the project area. Measurements include:

| | Length | Width | Thickness | Haft Length | Basal Width |
|---|---|---|---|---|---|
| Count | 6 | 13 | 16 | 16 | 11 |
| Mean | 82.3 | 36.2 | 10.2 | 15.1 | 22.3 |
| Range | 62-100 | 32-41 | 9-12 | 11-21 | 18-27 |

Chapman, in his summary (1975:246) notes that axial length of Etley points ranges from 13-25 cm, but is generally 17.5 cm; greatest width is at the shoulders, about one-fifth of length; barbs range between 7 and 10 mm long; and bases are expanding. Kay (1978:8-82, 86, 88; Figure 8-23) reports that 42 Etley points were recovered at Rodgers Shelter and measure:

| | Length | Width | Thickness |
|---|---|---|---|
| Range | 50-90 | 34-50 | 7-12 |

**Category 355 Small Haft, Straight Stem = (n=3) (Plate 4)**

Goldberg and Roper (1981:43) have defined these as straight stemmed points with concave bases, shoulder barbs and "leaf-shaped" blades. This is another "straight stemmed" type.

Survey sample:

| | Length | | | Width | | | Maximum |
|---|---|---|---|---|---|---|---|
| | Axial | Blade | Tang | Shoulder | Tang | Basal | Thickness |
| Count | 0 | 0 | 2 | 2 | 2 | 2 | 2 |
| Mean | - | - | 12.5 | 29.0 | 12.5 | 12.0 | 9.0 |
| S | - | - | 2.12 | 4.0 | 3.54 | 2.0 | 2.83 |

Measurements for Goldberg and Roper's (1981:43) sample are:

| | Length | Width | Thickness | Haft Length | Basal Width |
|---|---|---|---|---|---|
| Count | 3 | 13 | 14 | 13 | 0 |
| Mean | 63.0 | 32.9 | 8.9 | 15.0 | 15.3 |
| S | 15.1 | 3.4 | 1.2 | 2.2 | 3.7 |
| Range | 47-77 | 28-38 | 7-11 | 12-18 | 11-20 |

**Category 327 Truman Broadblade Variant A = (n=4) (Plate 5)**

This is classified by Goldberg and Roper (1981:35) within side-notched points. As its name implies, this is a broad bladed type, with rounded barbs, long notches, and a moderately expanding straight stem.

Survey sample:

| | Length | | | Width | | | Maximum |
|---|---|---|---|---|---|---|---|
| | Axial | Blade | Tang | Shoulder | Tang | Basal | Thickness |
| Count | 1 | 1 | 4 | 3 | 4 | 3 | 3 |
| Mean | 50.00 | 40.0 | 12.25 | 38.67 | 19.25 | 20.33 | 11.0 |
| S | - | - | 2.12 | 5.79 | 3.10 | 5.51 | 0 |

Goldberg and Roper (1981:35):

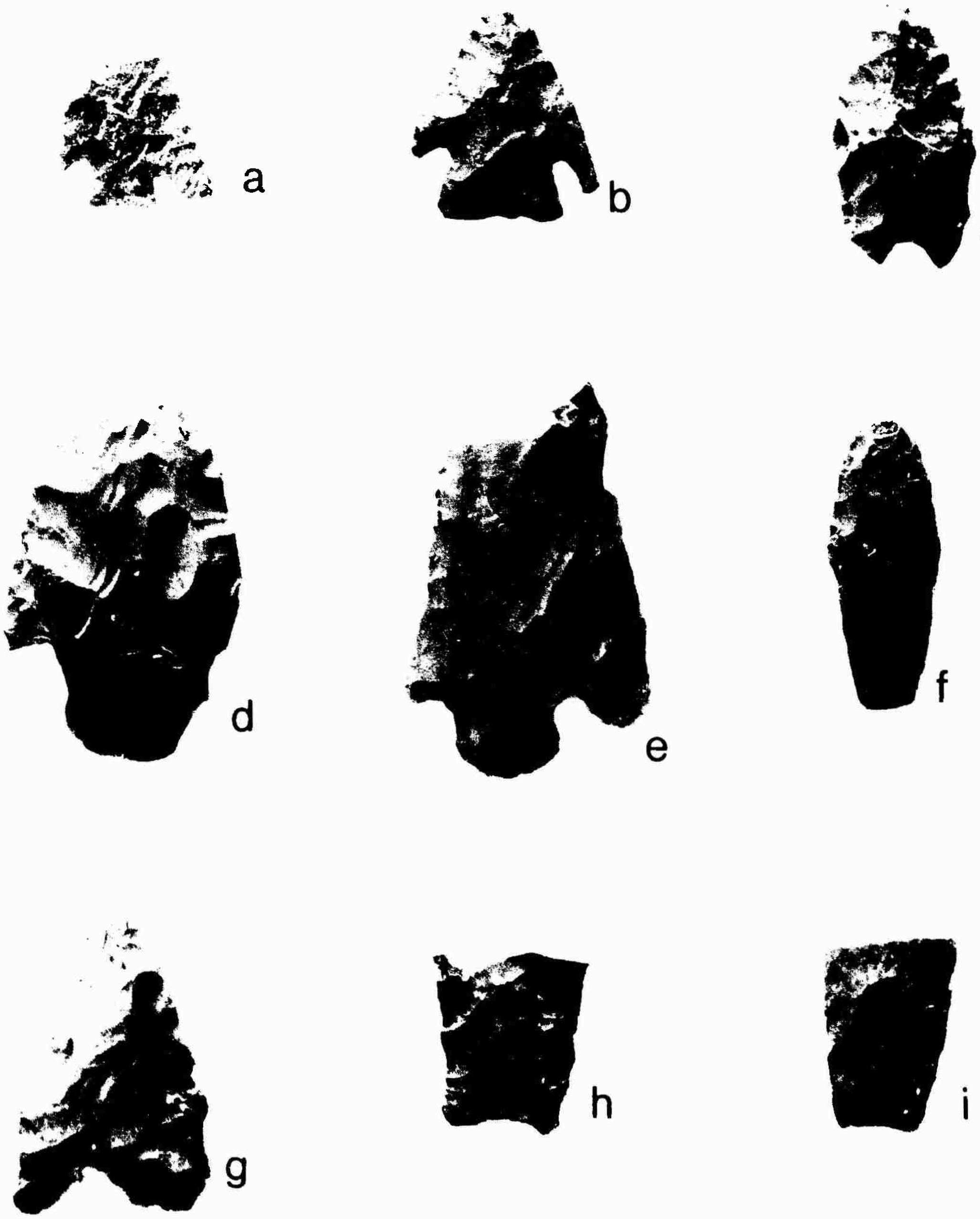
| | Length | Width | Thickness | Haft Length | Basal Width |
|---|---|---|---|---|---|
| Count | 1 | - | 5 | 5 | 3 |
| Mean | 71 | - | 8.8 | 12.8 | 25.7 |
| S | - | - | 1.6 | 1.9 | 2.1 |
| Range | 71 | - | 7-11 | 11-16 | 24-28 |

**Category 362 Miscellaneous Straight Stemmed = (n=5) (Plate 4)**

Goldberg and Roper (1981:44-45) designated this group on the basis of four different specimens whose only similarity was the straight stem. Consequently they provide no summary statistics.

Survey sample:

| | Length | | | Width | | | Maximum |
|---|---|---|---|---|---|---|---|
| | Axial | Blade | Tang | Shoulder | Tang | Basal | Thickness |
| Count | 0 | 0 | 5 | 5 | 5 | 5 | 4 |
| Mean | - | - | 13.80 | 26.60 | 19.20 | 18.20 | 8.0 |
| S | - | - | 2.95 | 4.56 | 3.35 | 5.12 | 1.41 |




Scale: Actual Size

a. CATEGORY 402 23HE883
b. CATEGORY 402-23SR1021
c. CATEGORY 406-23SR1015
d. CATEGORY 327-328-TRUMAN BROAD BLADE-23SR1032
e. CATEGORY 327-328-TRUMAN BROAD BLADE-23HI487
f. CATEGORY 344, NEBO HILL, 23HE913
g. CATEGORY 350, DALTON 23SR1021
h. CATEGORY 408, 23SR1018
i. CATEGORY 409, RICE LANCEOLATE, 23SR1025

**PLATE 5**
**BASAL-NOTCHED AND LANCEOLATE PROJECTILE POINTS**
HARRY S. TRUMAN RESERVOIR-OSAGE RIVER BASIN
U.S. ARMY ENGINEER DISTRICT-KANSAS CITY, MISSOURI

**Category 330 Gary = (n=2) (Plate 6a, b)**

Gary points are grouped by Goldberg and Roper (1981) with "contracting stemmed" types. These are defined by slightly to sharply contracting stems, rounded to pointed bases; straight, slightly rounded shoulders, and a triangular to ovate blade.

| | Length | | | Width | | | Maximum |
|---|---|---|---|---|---|---|---|
| | Axial | Blade | Tang | Shoulder | Tang | Basal | Thickness |
| Count | 1 | 1 | 2 | 2 | 2 | 2 | 2 |
| Mean | 84.00 | 63.00 | 21.00 | 29.00 | 19.00 | 15.50 | 8.0 |
| S | - | - | 0.0 | 0.0 | 2.83 | 3.54 | 0 |

Goldberg and Roper's (1981:45) summary statistics are:

| | Length | Width | Thickness | Haft Length | Basal Width |
|---|---|---|---|---|---|
| Count | 8 | 24 | 36 | 34 | 36 |
| Mean | 60.6 | 34.5 | 8.8 | 21.2 | 1.5 |
| S | 16.0 | 5.2 | 2.4 | 3.0 | 4.3 |
| Range | 42-91 | 26-44 | 6-15 | 16-27 | 0-16 |

**Category 332 Standlee = (n=6)**

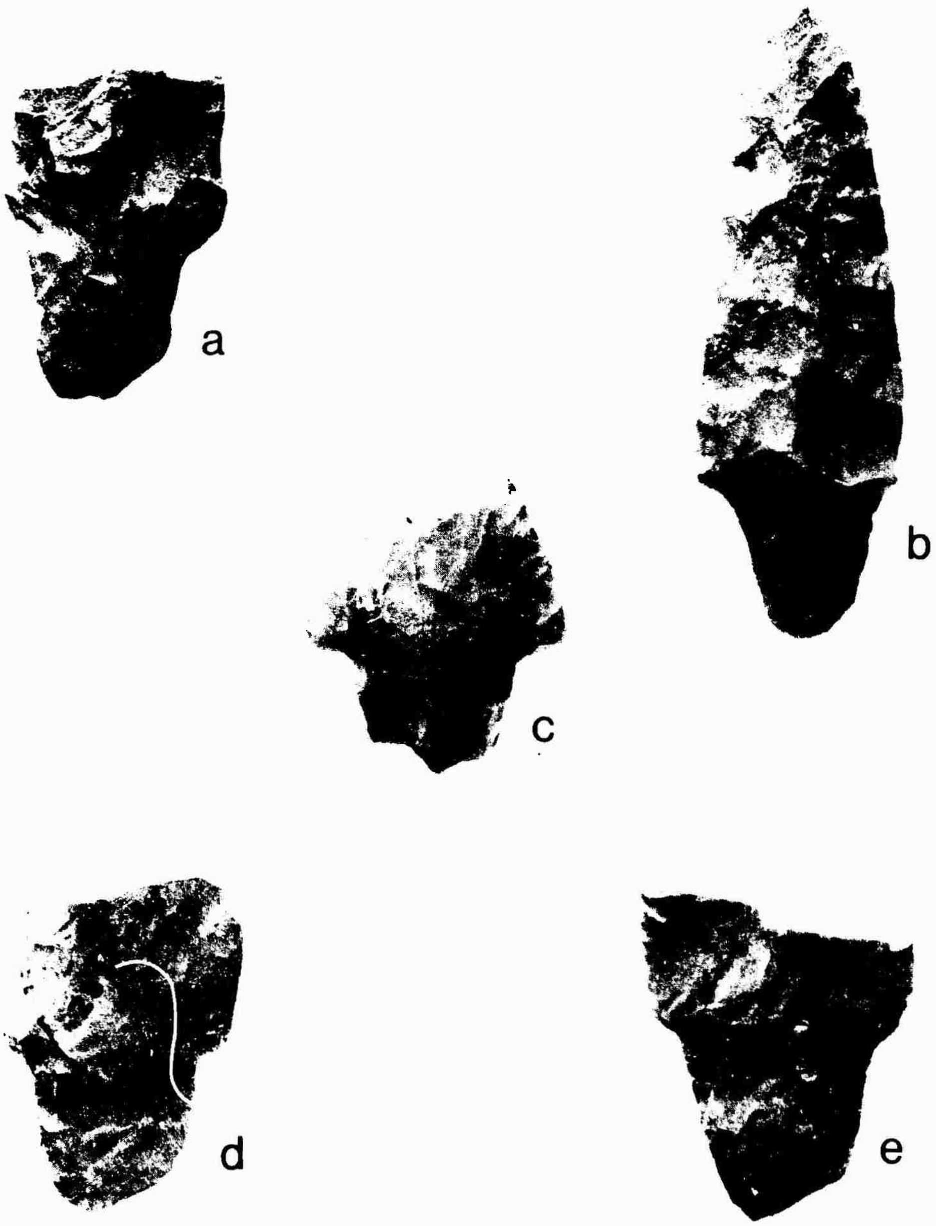
Standlee points, like Garys, have contracting stems. Standlees are characterized by large blades, shoulders that range from slight to prominant, and a straight to concave base. These are similar to Langtry points.

Survey sample:

| | Length | | | Width | | | Maximum |
|---|---|---|---|---|---|---|---|
| | Axial | Blade | Tang | Shoulder | Tang | Basal | Thickness |
| Count | 4 | 4 | 6 | 5 | 6 | 6 | 6 |
| Mean | 57.00 | 40.00 | 18.17 | 34.60 | 23.33 | 15.67 | 7.67 |
| S | 11.69 | 11.05 | 1.84 | 5.94 | 2.06 | 2.73 | 1.75 |

Goldberg and Roper's (1981:47) summary statistics are:

| | Length | Width | Thickness | Haft Length | Basal Width |
|---|---|---|---|---|---|
| Count | 28 | 73 | 114 | 105 | 101 |
| Mean | 56.9 | 33.2 | 7.8 | 19.8 | 13.1 |
| S | 11.4 | 6.6 | 1.5 | 3.2 | 3.2 |
| Range | 36-88 | 24-48 | 6-15 | 11-32 | 0-19 |




a. CATEGORY 330, GARY 23HI484
b. CATEGORY 330, GARY 23HI489
c. CATEGORY 331, 23HE892
d. CATEGORY 343, WAUBESA, 23SR1036
e. CATEGORY 343, WAUBESA, 23HI487

Scale: Actual Size

PLATE 6
**CONTRACTING STEMMED PROJECTILE POINTS**
HARRY S. TRUMAN RESERVOIR-OSAGE RIVER BASIN
U.S. ARMY ENGINEER DISTRICT-KANSAS CITY, MISSOURI

**Category 343 Waubesa = (n=1) (Plate 6)**

Only one Waubesa point was recovered during this survey, and only two specimens were analyzed by Goldberg and Roper (1981:48).

Survey specimen measurements:

| Length | | | Width | | | Maximum |
|---|---|---|---|---|---|---|
| Axial | Blade | Tang | Shoulder | Tang | Basal | Thickness |
| 20.0 | 15.0 | 5.0 | 9.0 | 5.0 | 9.0 | 3.0 |

Roper and Goldberg's summary statistics are:

| | Length | Width | Thickness | Haft Length |
|---|---|---|---|---|
| Count | 1 | 2 | 2 | 2 |
| Measurements | 111 | 37 each | 8, 9 | 24, 26 |

**Category 302 Small Corner-notched, Concave-based (n=1)**

This group was titled "small corner-notched, concave-based" because these specimens did not resemble closely any known types. These points were recognized by their broadly barbed shoulders, which are just larger than their bases. Bases expand, however, but the corners are rounded. Only one specimen was recovered during the present survey. Goldberg and Roper (1981:53) report on a sample of 17 specimens in Category 302 which they feel are "similar to several specimens at Rodgers Shelter in Kay's (1978:8-35) Category 14." Kay's Category 14 (Kay 1978:8-40 to 8-42, Figure 8-10 i-m) illustrates some variety, which in some instances (e.g. Figure 8-10 k), may be a function a blade attrition and reworking.

The specimen made of Jefferson City chert recovered during the present survey measures:

| Length | | | Width | | | Maximum |
|---|---|---|---|---|---|---|
| Axial | Blade | Tang | Shoulder | Tang | Basal | Thickness |
| 18.0 | 13.0 | 5.0 | 17.0 | 9.0 | 13.0 | 4.0 |

Measurements reported by Goldberg and Roper (1981:53) for Category 302 include (no specimens were complete therefore length is not given).

| | Width | Thickness | Haft Length | Basal Width |
|---|---|---|---|---|
| Count | 3 | 14 | 14 | 10 |
| Mean | 22.0 | 5.2 | 10.3 | 16.9 |
| S | 5.6 | .7 | 1.9 | 3.5 |
| Range | 16-27 | 4-6 | 7-13 | 11-21 |

Measurements for the Rodgers Shelter assemblage of similar points reported by Kay (1978:8-41) for 26 specimens in category 14 are:

| Dimension | Minimum | Maximum |
|---|---|---|
| Length | 27 | 34 |
| Width | 17 | 25 |
| Thickness | 4 | 7 |

The single specimen recovered during this survey falls at the small range of the measurement spectrum for Category 302.

**Category 306 = Small Corner-notched, Straight-based (n=6) (Plate 7b, c)**

Another group of unidentifiable projectile points, similar to those in Category 302 are these "small corner-notched, straight based" points. These points have triangular blades, well defined but small shoulders, slightly expanding straight base. Of the six specimens recovered during the survey reported on here, two each were made from Jefferson City Mottled, Burlington, and Chouteau cherts. These measure:

| | Length | | | Width | | | Maximum |
|---|---|---|---|---|---|---|---|
| | Axial | Blade | Tang | Shoulder | Tang | Basal | Thickness |
| Count | 3 | 2 | 5 | 4 | 6 | 5 | 6 |
| Mean | 24.00 | 22.50 | 9.80 | 21.0 | 10.67 | 15.6 | 6.5 |
| S | 13.89 | 2.12 | 0.45 | 1.41 | 2.50 | 1.67 | 1.05 |

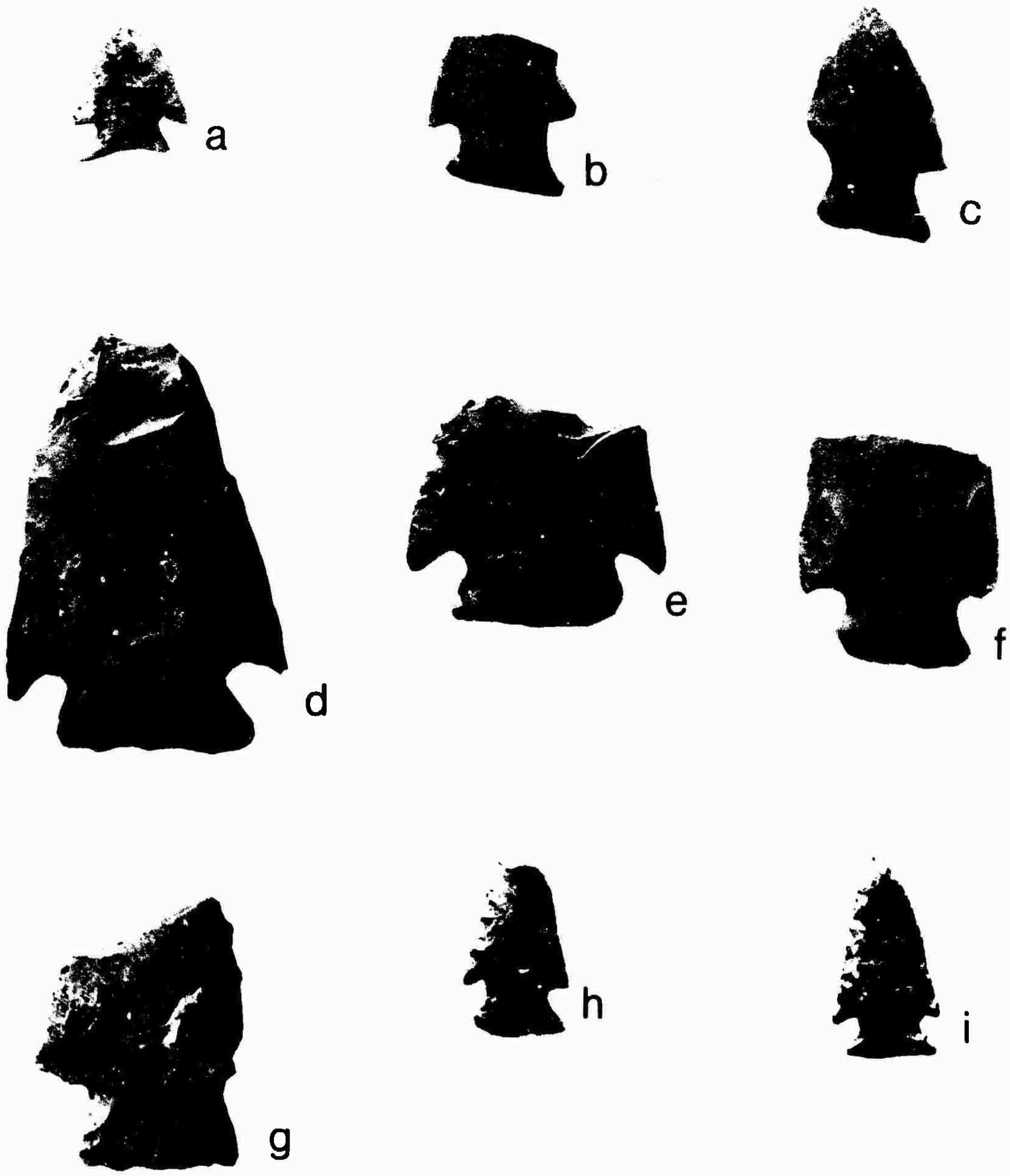
Goldberg and Roper's (1981:54) sample of ten points in this category measured:

| | Length | Width | Thickness | Haft Length | Blade Width |
|---|---|---|---|---|---|
| Count | 4 | 7 | 10 | 9 | 4 |
| Mean | 34.0 | 20.4 | 6.1 | 10.2 | 19.2 |
| S | 4.1 | 2.5 | .7 | 1.0 | 2.7 |
| Range | 30-38 | 16-23 | 5-7 | 9-12 | 16-22 |

With the exception of length, projectile points analyzed during this analysis compare closely with those reported by Goldberg and Roper (1981:54) as well as Kay (1978).

**Category 354 Rice Lobed = (n=1) (Plate 8)**

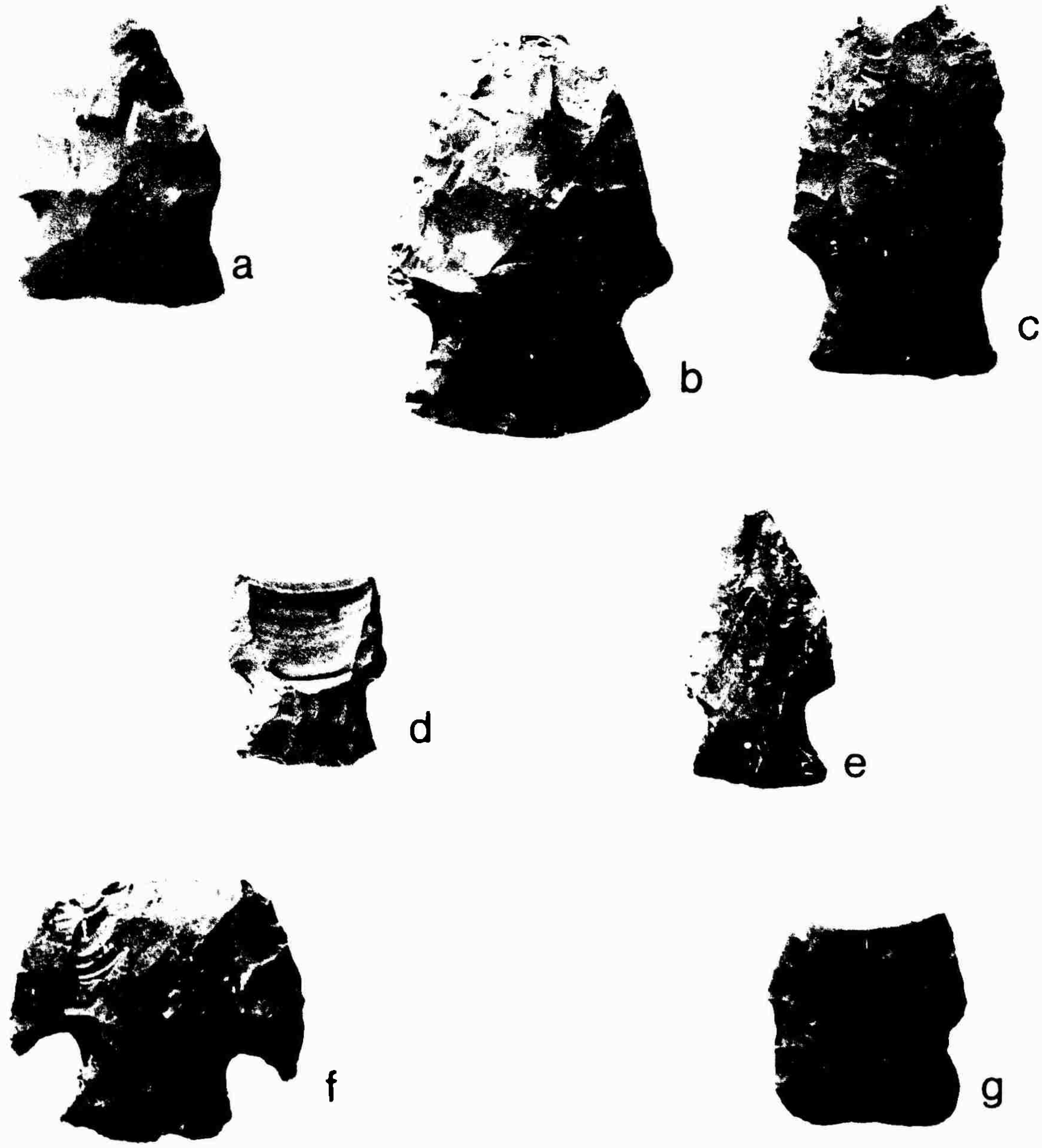
Rice Lobed projectile points were classified by Goldberg and Roper within the corner notched category. Blade edges of this type vary between straight and excurvate, shoulders are well defined, base varies from slightly convex to concave.




a. CATEGORY 302 23SR1025
b. CATEGORY 306 23SR1025
c. CATEGORY 306 23HE894
d. CATEGORY 307 AFTON 23HI484
e. CATEGORY 307 AFTON 23HI484
f. CATEGORY 307 AFTON 23SR1023
g. CATEGORY 307 AFTON 23SR1025
h. CATEGORY 309 23HE894
i. CATEGORY 309 23HI482

Scale: Actual Size

PLATE 7
**CORNER-NOTCHED PROJECTILE POINTS**
HARRY S. TRUMAN RESERVOIR-OSAGE RIVER BASIN
U.S. ARMY ENGINEER DISTRICT-KANSAS CITY, MISSOURI




a. CATEGORY 310-311- 23SR1015
b. CATEGORY 310-311- 23BE1027
c. CATEGORY 310-311- 23HE867
d. CATEGORY 314- 23SR1009
e. CATEGORY 314- 23HE894
f. CATEGORY 317 23SR997
g. CATEGORY 354, RICE LOBED 23SR1016

Scale: Actual Size

PLATE 8
**CORNER-NOTCHED PROJECTILE POINTS**
HARRY S. TRUMAN RESERVOIR-OSAGE RIVER BASIN
U.S. ARMY ENGINEER DISTRICT-KANSAS CITY, MISSOURI

| Length | | | Width | | | Maximum |
|---|---|---|---|---|---|---|
| Axial | Blade | Tang | Shoulder | Tang | Basal | Thickness |
| broken | broken | 16.0 | 30.0 | 26.0 | 28.0 | 8.0 |

Goldberg and Roper's (1981:57) sample of 12 Rice Lobed points had the following measurements:

| | Length | Width | Thickness | Haft Length | Basal Width |
|---|---|---|---|---|---|
| Count | 2 | 6 | 12 | 10 | 9 |
| Mean | | 39.3 | 8.5 | 15.9 | 28.0 |
| S | | 5.9 | 1.5 | 2.9 | 3.6 |
| Range | 58-69 | 33-48 | 6-10 | 11-22 | 23-34 |

Kay (1978:8-51-53, 55 Figure 8-14) notes that the Rodgers Shelter specimens have "straight to highly incurvate" blades with alternate beveling and serrations. Eleven specimens were measured and range from:

| Dimension | Minimum | Maximum |
|---|---|---|
| Length | 55 | 97 |
| Width | 30 | 54 |
| Thickness | 6 | 17 |

The differences between blade edges reported by Goldberg and Roper (1981), that is, straight to excurvate, as opposed to the Rodgers Shelter specimens, that are incurvate, are probably due to extensive use (Kay 1978). Blade attrition is related to the use and curation of tools. Cable (1981) in an analysis of Kirk points from the Fall Line region of North Carolina presents such a sequence of intensive utilization. Although Kay (1978:8-53) suggests this concept, it is not explicated. Similarities between the survey specimen and those reported by Goldberg and Roper (1981:57) are surprisingly close.

**Category 307 Afton = (n=8) (Plate 7)**

Afton projectile points were first reported by Holmes (1903) near Afton, Oklahoma, and later typed by Bell and Hall (1953:7). Some have described them as "angular" (Bell 1958:6, Wood 1961:88), while others have stressed their "corner-notched" form (Chapman 1975:240; Goldberg and Roper 1981:60; Roper and Piontkowski 1977:222; Wood 1961:88). However, a more recent and popular description for the form is "pentagonal" (Kay 1978:8-74), an appropriate term for this rather unusual type. Blades may be short or long depending on the angles within the tip of the pentagonal form. Shoulders are angular with barbs that vary, while notches are narrow and deep. Bases are straight to convex, and are most often slightly expanding.

Survey sample:

| | Length | | | Width | | | Maximum |
|---|---|---|---|---|---|---|---|
| | Axial | Blade | Tang | Shoulder | Tang | Basal | Thickness |
| Count | 0 | 1 | 6 | 5 | 8 | 4 | 8 |
| Mean | - | 34.00 | 11.00 | 32.40 | 19.63 | 23.50 | 7.13 |
| S | - | - | 0.63 | 4.62 | 3.38 | 1.92 | 1.13 |

Goldberg and Roper's (1981:54) sample included 54 specimens:

| | Length | Width | Thickness | Haft Length | Basal Width |
|---|---|---|---|---|---|
| Count | 7 | 22 | 51 | 52 | 34 |
| Mean | 45.7 | 34.9 | 6.9 | 12.0 | 23.9 |
| S | 8.6 | 4.7 | 1.0 | 1.6 | 4.0 |
| Range | 35-59 | 28-45 | 5-10 | 9-16 | 10-31 |

Roper and Piontkowski's (1977:222) sample:

| | Length | Width | Thickness | Haft Length | Basal Width |
|---|---|---|---|---|---|
| Count | 2 | 2 | 4 | 4 | 3 |
| Mean | 37.5 | 34.5 | 5.5 | 8.75 | 23 |
| Range | 36-39 | 31-38 | 5-6 | 4-12 | 20-37 |

Kay's (1978:8-74, 77 Figure 8-20) sample:

| | | | |
|---|---|---|---|
| Range | 53-55 | 28-40 | 5-7 |

Chapman's (1975:240) sample:

| | | | |
|---|---|---|---|
| Range | 40-100 | 35 | 5-8 |
| (majority) | 50-85 | | |

With the exception of length, which could not be recorded on the survey sample, most measurements exhibit a high degree of homogeniety with other described samples.

**Category 309 = Medium, Elliptical Corner-notched (n=4) (Plate 8)**

This group reflects a series of corner-notched specimens that could not be classified to a known type. These specimens have triangular blades with straight to convex edges, barbed shoulders, deep notches, and subconcave bases that expand from the notch juncture.

Survey sample:

| | Length | | | Width | | | Maximum |
|---|---|---|---|---|---|---|---|
| | Axial | Blade | Tang | Shoulder | Tang | Basal | Thickness |
| Count | 3 | 3 | 4 | 4 | 4 | 3 | 4 |
| Mean | 36.67 | 30.67 | 9.00 | 22.25 | 12.00 | 19.00 | 6.25 |
| S | 4.16 | 8.08 | 1.16 | 0.5 | 1.16 | 1.00 | 0.96 |

Goldberg and Roper's (1981:61-62) summary statistics are:

| | Length | Width | Thickness | Basal Width |
|---|---|---|---|---|
| Count | 8 | 15 | 25 | 16 |
| Mean | 39.4 | 27.1 | 11.9 | 18.21 |
| S | 7.9 | 3.4 | 1.4 | 3.4 |
| Range | 26-49 | 22-33 | 5-8 | 14-25 |

**Category 310 = Corner-notched with Angular to Barbed Shoulders (n=3) (Plate 8)**

As with Category 309, this group of 57 points was not similar to a reported type, consequently, Goldberg and Roper (1981:62) refer to these as "corner-notched with angular to barbed shoulders." Blades of these points are triangular with "irregular convex edges", well defined shoulders, deep notches, and convex bases that expand. They note that their Category 310 is similar to Kay's (1978)" Category 48 recovered from the Late Archaic and Woodland levels at Rodgers Shelter.

Survey sample:

| | Length | | | Width | | | Maximum |
|---|---|---|---|---|---|---|---|
| | Axial | Blade | Tang | Shoulder | Tang | Basal | Thickness |
| Count | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Mean | 52.00 | 35.00 | 17.00 | 35.67 | 24.00 | 30.00 | 9.33 |
| S | 6.93 | 4.36 | 2.65 | 5.69 | 3.60 | 5.29 | 1.53 |

Goldberg and Roper (1981:62):

| | Length | Width | Thickness | Haft Length | Basal |
|---|---|---|---|---|---|
| Count | 12 | 21 | 57 | 52 | 35 |
| Mean | 52.8 | 34.9 | 8.1 | 14.5 | 26.2 |
| S | 11.4 | 3.8 | 1.3 | 1.7 | 3.5 |
| Range | 37-71 | 26-41 | 6-12 | 11-19 | 19-32 |

Kay's (1978:8-81, 82, 85, Figure 8-22) Category 48, Corner-notched point "includes 42 artifacts." Summary measurements are:

| | Length | Width | Thickness |
|---|---|---|---|
| Range | 49-55 | 28-36 | 6-11 |

**Category 317 Snyders (n=3) (Plate 8)**

Snyders points were identified in Illinois by Scully (1951) and White (1965). They have been reported in Missouri by Chapman (1980) and in the Truman Reservoir area by Goldberg and Roper (1981:65) with a sample of 20, and Roper and Piontkowski (1977:228-231) with a sample of 13. These are large points having broad blades with convex edges, broad, barbed shoulders, deep notches, and subconvex, expanding bases.

Survey sample:

| | Length | | | Width | | | Maximum |
|---|---|---|---|---|---|---|---|
| | Axial | Blade | Tang | Shoulder | Tang | Basal | Thickness |
| Count | - | - | 3 | 3 | 3 | 3 | 3 |
| Mean | - | - | 12.67 | 34.67 | 18.33 | 23.33 | 7.33 |
| S | - | - | 1.53 | 7.23 | 3.51 | 2.52 | 0.58 |

Goldberg and Roper's (1981:65) sample:

| | Length | Width | Thickness | Haft Length | Basal Width |
|---|---|---|---|---|---|
| Count | 5 | 13 | 20 | 20 | 14 |
| Mean | 63.2 | 42.1 | 8.8 | 15.4 | 27.0 |
| S | 7.0 | 4.8 | 4.8 | 1.8 | 3.0 |
| Range | 53-72 | 36-51 | 7-11 | 12-19 | 22-34 |

Roper and Piontkowski (1977:229):

| | Length | Width | Thickness | Haft Length | Basal Width |
|---|---|---|---|---|---|
| Count | 5 | 8 | 13 | 12 | 13 |
| Mean | 57.8 | 38.4 | 8.7 | 15.2 | 28.1 |
| Range | 48-64 | 34-48 | 7-10 | 13-19 | 22-32 |

Chapman (1980:312) notes that point length ranges from 50 to 150 mm, while most are between 70 and 80 mm, while width is usually greater than half of the axial length. The survey specimens are generally smaller than those recorded previously in the area.

**Category 314 Expanding Stem (n=2) (Plate 8)**

Goldberg and Roper (1981:65-66) included 11 points in the "expanding stem" Category within their broad corner notched group. Blades on these points are straight to excurvate, shoulders are short but well developed, and the expanding bases are straight to convex. Bases expand to nearly shoulder width.

Survey sample:

| | Length | | | Width | | | Maximum |
|---|---|---|---|---|---|---|---|
| | Axial | Blade | Tang | Shoulder | Tang | Basal | Thickness |
| Count | - | - | 2 | 2 | 2 | 2 | 2 |
| Mean | - | - | 13.50 | 22.50 | 16.00 | 20.50 | 5.5 |
| S | - | - | 0.71 | 0.71 | 1.41 | 0.41 | 0.71 |

Goldberg and Roper's (1981:66) sample:

| | Length | Width | Thickness | Haft Length | Basal Width |
|---|---|---|---|---|---|
| Count | 1 | 3 | 11 | 11 | 9 |
| Mean | 28.0 | 30.3 | 7.2 | 13.7 | 24.1 |
| S | - | 3.2 | 1.3 | 2.1 | 3.8 |
| Range | - | 28-34 | 6-9 | 12-17 | 15-29 |

**Category 323 Reed (n=1) (Plate 10 e)**

Small Reed projectile points or "arrows" are not especially common in the Reservoir area, or perhaps they are often included with Cahokia types. The type was defined by Baerreis (1954:44) from the type site, Reed, in northeastern Oklahoma. Goldberg and Roper (1981:72) report on 14 specimens. They describe the point as having a straight-edged triangular blade, shallow side notches, and a straight base. In an earlier report, Roper and Piontkowski (1977:239) grouped all "small notched" points into one class. Scallorns, like Reed points are small, however these are corner-notched and generally have rounded bases. All three types are illustrated by Chapman (1980: Appendix III). He defines the Reed type as an isosceles triangle with side notches in their basal quarter. All of these small types are associated with Late Woodland and Mississippian temporal horizons, and are common in rockshelters (e.g. Chomko 1977; Novick and Cantley 1977; Wood 1961) in the project area. The specimen recovered from Stratum 1, Site 23HI484, was broken, however, comparable recorded measurements include 17 mm-basal width, 26 mm-tang width, 36 mm-shoulder width, and 25 mm-tang length.

Goldberg and Ropers (1981:72-73) sample of Reed points measured:

| | Length | Width | Thickness | Haft Length | Basal Width |
|---|---|---|---|---|---|
| Count | 5 | 12 | 14 | 14 | 9 |
| Mean | 18.0 | 11.1 | 2.8 | 6.4 | 11.2 |
| S | 2.0 | 2.1 | .6 | 2.2 | 2.2 |
| Range | 16-21 | 9-15 | 2-4 | 4-11 | 8-14 |

Forty-six, small notched specimens analyzed by Roper and Piontkowski (1977:239-241) measured:

| | Length | Width | Thickness | Haft Length | Basal Width |
|---|---|---|---|---|---|
| Count | 13 | 41 | 46 | 43 | 46 |
| Mean | 22.8 | 13.3 | 3.7 | 7.4 | 10.2 |
| Range | 17-23 | 10-18 | 3-6 | 6-11 | 7-17 |

Kay (1978) in his analysis of Rodgers Shelter projectile points reported no Reed types, rather there were Scallorns and Cahokias. His illustrations of Cahokia points (Figure 8.9 r-t) are similar to the Reed type, consequently, measurements are presented below.

| | Length | Width | Thickness |
|---|---|---|---|
| Range | indeterminate | 12-15 | 1-2 |

**Category 322 Scallorn = (n=4) (Plate 10 a-d)**

Scallorn points were first reported by Kelly (1947) as Scallorn stemmed, a term later reduced to Scallorn (Suhm and Krieger 1954) for assemblages recovered in Texas. The type is found also throughout Oklahoma and the Mississippi River Valley. As noted in the discussion of Reed points, Scallorns are small, triangular points with corner notches. Measurements for Scallorns reported in the project area are presented below.

Survey sample:

| | Length | | | Width | | | Maximum |
|---|---|---|---|---|---|---|---|
| | Axial | Blade | Tang | Shoulder | Targ | Basal | Thickness |
| Count | 1 | 1 | 2 | 3 | 4 | 3 | 2 |
| Mean | 23 | 18.0 | 8.00 | 17.67 | 10.25 | 13.67 | 3.50 |
| S | - | - | 4.24 | 10.69 | 5.74 | 6.51 | 0.71 |

Goldberg and Roper (1981:71) report on a sample of 48 points:

| | Length | Width | Thickness | Haft Length | Basal Width |
|---|---|---|---|---|---|
| Count | 12 | 39 | 48 | 45 | 34 |
| Mean | 25.0 | 12.3 | 3.6 | 6.9 | 8.7 |
| S | 6.1 | 1.9 | .8 | 1.2 | 1.7 |
| Range | 17-39 | 9-17 | 2-6 | 4-9 | 6-13 |

Kay (1978:8-33) reported that Rodgers Shelter specimens were pressure flaked on ventral surfaces, while flaking of dorsal surfaces varies. Dimensions included:

| | Length | Width | Thickness |
|---|---|---|---|
| Range | 19-41 | 7-24 | 2-4 |

**Category 334 Fresno = (n=1) (Plate 10g)**

The Fresno point, a small triangular, was originally defined by Kelly (1947) in Texas. Bell (1960:44) notes its distribution throughout Texas and Oklahoma, as well as most of the Mississippi River Valley. Goldberg and Roper (n.d.) describe the point as a triangular arrow having straight or convex edges with a straight or subconvex base. The single specimen recovered during the present survey was broken, however, its maximum thickness is 3mm and basal width is 14mm.

Goldberg and Roper (1981:73) report:

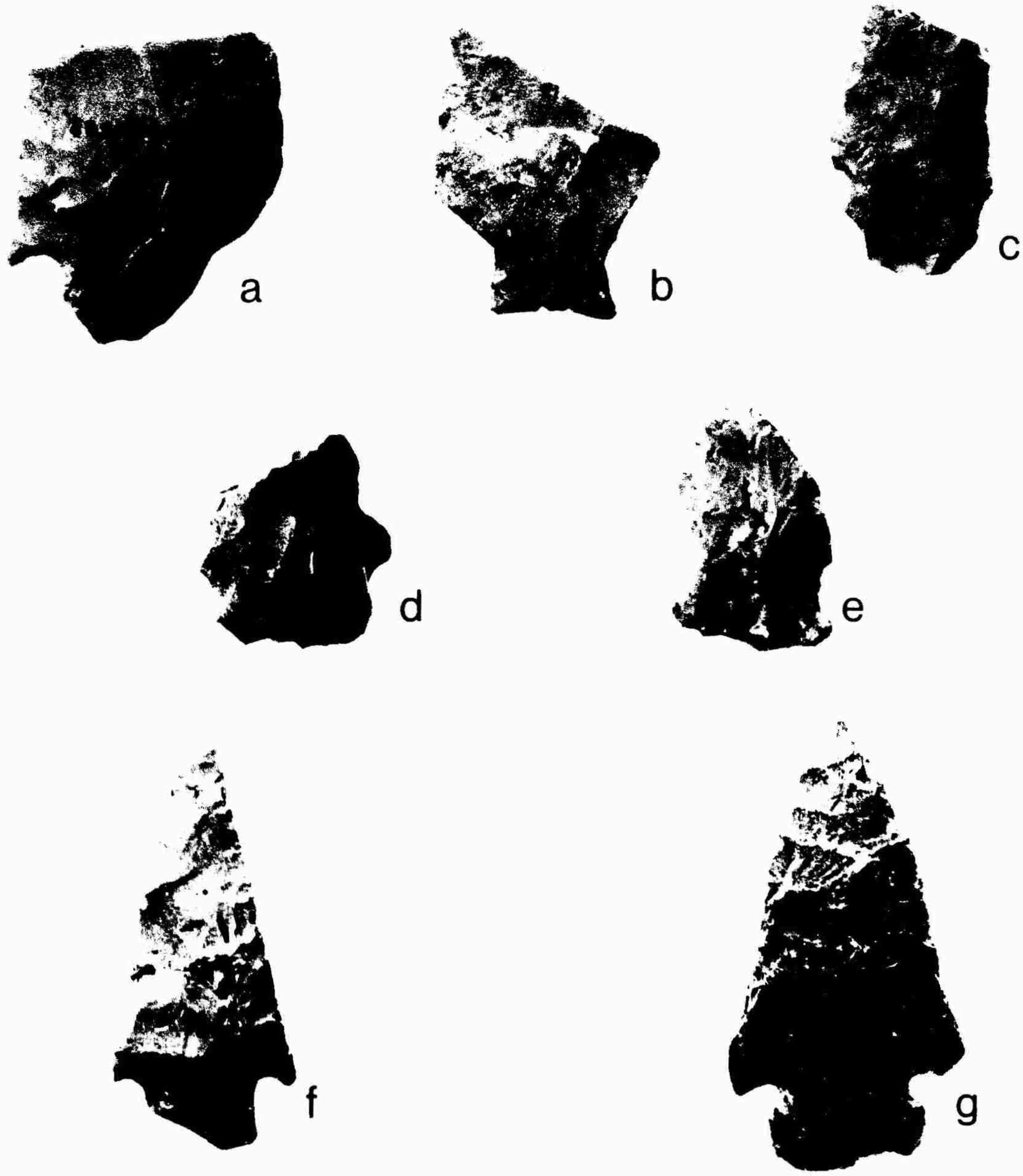
| | Length | Width | Thickness | Basal Width |
|---|---|---|---|---|
| Count | 6 | 12 | 12 | 11 |
| Mean | 23.7 | 12.8 | 3.1 | 6.0 |
| S | 5.8 | 2.6 | .7 | 7.2 |
| Range | 7-33 | 8-16 | 2-4 | 8-16 |

**Category 364 Unclassifiable Corner-notched (n=16) (Plate 9)**

Goldberg and Roper (1981:70-71) included 75 points within this "Unclassifiable corner-notched" category. No measurements were given because many specimens were broken.

Survey sample:

| | Length | | | Width | | | Maximum Thickness |
|---|---|---|---|---|---|---|---|
| | Axial | Blade | Tang | Shoulder | Tang | Basal | |
| Count | 1 | 1 | 10 | 5 | 9 | 8 | 14 |
| Mean | 52.0 | 34.0 | 13.50 | 31.40 | 19.78 | 21.63 | 6.93 |
| S | - | - | 3.24 | 8.50 | 3.60 | 2.56 | 1.49 |




a. CATEGORY 364 23SR997
b C. TEGORY 364 23HI484
c. CATEGORY 384 23HE694
d. CATEGORY 364 23SR997
e. CATEGORY 363 23SR1012
f. CATEGORY 400 23BE1020
g. CATEGORY 407 23HE666

Scale: Actual Size

**PLATE 9**

**CORNER-NOTCHED PROJECTILE POINTS**

HARRY S. TRUMAN RESERVOIR-OSAGE RIVER BASIN

U.S. ARMY ENGINEER DISTRICT-KANSAS CITY, MISSOURI


a. CATEGORY 322, SCALLORN 23HI487
b. CATEGORY 322, SCALLORN 23HI484
c. CATEGORY 322, SCALLORN 23HI487
d. CATEGORY 322, SCALLORN 23SR997
e. CATEGORY 323, REED 23HI487
f. CATEGORY 334, FRESNO 23BE1027
g. CATEGORY 334, FRESNO 23 HE879

Scale: 2X

PLATE 10
**ARROW CLASS PROJECTILE POINTS**
HARRY S. TRUMAN RESERVOIR-OSAGE RIVER BASIN
U.S. ARMY ENGINEER DISTRICT-KANSAS CITY, MISSOURI

**Category 400 (n=12) (Plate 9)**

Category 400 includes corner-notched points and point fragments that could not be classified into known types. These range from small (shoulder width 13 mm) to large (40 mm). Corner-notches vary resulting in basal shapes that range from straight stemmed to rounded to expanding. Bases that are not rounded are straight. Many specimens have transverse blade breaks; others have impact fractures. All chert types are represented. Style of manufacture varies, some having fine parallel, lamellar flake scars along the blade edges; others exhibit random flake scars.

**Category 402 (n=2) (Plate 5)**

This category includes two basal notched points that could not be incorporated into any previously defined types (e.g. Goldberg and Roper 1981, Kay 1978). One specimen is made of Burlington chert and the very tip has been broken off, along with one should tang. The other is Jefferson City chert and has a transverse break and one broken shoulder tang. Blades are triangular with straight edges which extend the length of the point. Basal notches give an expanding shape to the basal tang. Bases are straight. Shoulder tangs or barbs are rounded and may be shorter than the length of the point, suggesting that they were reworked. Workmanship is good, blades and bases are pressure flaked, some step fractures are apparent as edge damage. These measure:

| | Lab. | Length | | | Width | | Maximum |
|---|---|---|---|---|---|---|---|
| Site | Provenience | Axial | Blade | Tang | Maximum | Base | Thickness |
| 23HE883 | LP814 | 29 | 27 | 9 | 26.5 | 18 | 5 |
| 23SR1021-2 | LP1046 | 21 | 21.5 | 6 | 24 | 12 | 4 |

**Category 403 (n=1) (Plate 4)**

The point is an unidentified, large, straight stemmed type. It is manufactured from oolitic Jefferson City chert and has a transverse tip break. The base is large and square, shoulders are short and angular in the style of Alberta points (Wormington 1957:134). Step fractures are present in the notch area. The base has been thinned by large flaking, and has fine pressure retouch as well as stepping in one area. Blade edges are straight, but tend to be excurvate towards the tip. Blade edges are serrated, however, the surface of one edge exhibits a number of thinning flakes that terminate with hinges. The point measures:

| Length | | | Width | | | Maximum |
|---|---|---|---|---|---|---|
| Axial | Blade | Tang | Shoulder | Tang | Base | Thickness |
| 80.0 | 62.0 | 19.0 | 37 | 26.0 | 29.0 | 8.0 |

**Category 404 (n=4) (Plate 3)**

This category includes four unidentifiable side notched points, some broken, but all having different shapes. One point, 23BT56-LP266, manufactured from Burlington chert has a transverse tip break and only one side-notch, the other side

retaining a small biface character. Heavy step fractures on the side notch as well as along the edges, and edge damage suggest that the point was used as it was, rather than representing an unfinished specimen broken during manufacture.

Another Burlington chert specimen, 23SR997-LP160, has a transverse blade break, as well as an angular basal break. The one remaining side-notched point is small and crescent shaped.

One nearly complete specimen, 23HI484-LP121, manufactured of Mottled Jefferson City Chert has basal ears in the style of Yadkin ears (Coe 1964:47) and Brewerton eared-notched points (Ritchie 1961:17). This point is unusual because it retains the flake curvature; there are a number of thinning flake attempts that ended as steps or fractures. The lateral and basal edges are stepped suggesting heavy use. The blade edges are slightly excurvate above the side notches.

The final specimen, 23SR1012-LP269, has a triangular blade with straight edges, slightly concave side-notches, rounded basal ears, and a concave base. In shape it is similar to Edgewood points defined by Suhm and Kreiger (1954:418) in Texas. The distribution of Edgewood points ranges from Texas across Oklahoma, and into the Mississippi River Valley (Bell 1958:20). The specimen from the survey has a thick blade with steep, parallel edge retouch suggesting intensive resharpening.

Measurements for these points are listed in Appendix B.

**Category 405 (n=1) (Plate 3)**

This point could not be classified into any previously defined type. In terms of its general shape and pronounced basal ears it is reminicent of Ritchie's (1961) Orient Fishtail and Otter Creek points described for New York State, or Ahler's Plate 6 (1971:13), Category 10 although it could not be classified as either. This point was manufactured from oolitic Jefferson City chert, and has a transverse break in the blade portion. The remaining blade portion suggests that it has slightly excurvate blade edges. Shoulders are rounded and slope gently from the blade edge into a gently curving, crescent shaped side notch. This long notch in combination with the basal concavity form a subrectangular basal ear. Flake scars are generally random, although it could not be classified as either. edges have smooth, lamellar flakes removed. Portions of the remianing blade are smoothed, side notched and the basal concavity exhibits step fractures. Measurements are:

| Length | | | Width | | | Maximum |
|---|---|---|---|---|---|---|
| Axial | Blade | Tang | Shoulder | Tang | Basal | Thickness |
| 38.0 | 20.0 | 17.0 | 23.0 | 16.0 | 22.0 | 7.0 |

**Category 406 (n=1) (Plate 5)**

This category includes one unusual point having a well defined basal notch or concavity. Blade edges are excurvate with slight shoulders about half way up the blade. Manufacturing technique is not especially fine; there are fine pressure flakes along the edge, as well as some stepping along the edge. In form, it is similar to

Wheeler points defined by Cambron (1955) in the Wheeler Basin of the Tennessee River. Bell (1960:94) notes that this type is found as far east as North Carolina and westward into Alabama. The specimen recovered during the survey measured:

| Length | | | Width | | Maximum |
|---|---|---|---|---|---|
| Axial | Blade | Tang | Shoulder | Basal | Thickness |
| 37 | 21 | 16 | 20 | 10 | 7.5 |

**Category 407 (n=1) (Plate 9)**

This category includes one well made, complete projectile point made of a dark brownish-gray chert. It has a broad triangular blade with a straight and slightly incurvate-excurvate blade edge. Corner notching creates short, angular shoulder barbs. One barb is broken. The basal stem expands slightly, however, the base is convex, giving a rounded, lobed appearance to the base. Large, parallel flakes extend from the blade edges to form a medial ridge. Finer retouch and step fractures are present. One portion of the base has a slight concavity formed by the removal of very small flakes. This may be the result of scraping activities or hafting damage. It measures:

| Length | | | Width | | | Maximum |
|---|---|---|---|---|---|---|
| Axial | Blade | Tang | Shoulder | Tang | Basal | Thickness |
| 62.5 | 54.0 | 12.5 | 34 | 19 | 20 | 7 |

**Category 408 (n=1) (Plate 5)**

This is an unidentified point base. It is similar to Rice Lanceolates, however, it has small, weakly developed basal ears. The base is slightly concave with small step fractures on one surface. There is a transverse break, however, blade edges were probably excurvate. Step fractures are apparent along the edges. It is made of mottled Jefferson City chert. Measurements are:

| Length | Maximum Thickness | Maximum Width | Basal Width |
|---|---|---|---|
| 25 | 6 | 22 | 17 |

**Category 409 Rice Lanceolate (n=1) (Plate 5i)**

Goldberg and Roper (1981) and Roper and Piontkowski (1977) report no Rice Lanceolates in the project area, however, Kay (1978:8-103, 104, 109-110 Figures 8-30, 31), reporting on excavations at Rodgers Shelter discusses an assemblage of 65 specimens. Bray (1956) originally defined these points during excavations at the Rice site in Stone County, Missouri. These may be simply described as a lanceolate with a slightly concave base. Edges are excurvate, often serrated; grinding is present on the haft portion (Chapman 1975:253, Kay 1978:8-10, Marshall 1957:108). Although there is some range in quality of manufacture, most are well made, exhibiting high quality, controlled flaking. Kay's (1978:8-104) measurements include:

| | Length | Width | Thickness |
|---|---|---|---|
| Range | 44-95 | 20-34 | 7-10 |

Marshall (1957:109):

| | Length | Blade Width | Basal Width | Length of Stem | Thickness |
|---|---|---|---|---|---|
| Range | 60-90 | 23-34 | 17-23 | 21-32 | 5-12 |

The one broken specimen was recovered during the survey. It measures in length-28 mm, in width-20 mm, and in basal width-11 mm. The specimen is well made, finely pressure flaked, with smoothed basal edges, and a transverse break.

**Category 999 (n=22)**

Goldberg and Roper (1981:71) included 62 specimens that were "sufficiently damaged" so that it was "impossible to determine even a general morphological class." These were not measured, and no date is presented. Specimens in the present survey sample were measured and these are presented below.

Survey sample:

| | Length | | | Width | | | Maximum |
|---|---|---|---|---|---|---|---|
| | Axial | Blade | Tang | Shoulder | Tang | Basal | Thickness |
| Count | 2 | 1 | 5 | 8 | 11 | 7 | 14 |
| Mean | 25.00 | 41.00 | 16.80 | 32.00 | 20.00 | 28.43 | 7.14 |
| S | 21.21 | - | 3.63 | 10.21 | 4.69 | 7.74 | 1.92 |

**Bifaces**

Our previous discussion has noted that bifaces are expected to be smaller and less variable in size and morphology in the prairie aggregates. This expectation is a function of our arguments about economizing technological strategies. There should be only minimal pressure to conserve lithic technologies in forager systems whose members generally return to a residence daily where ample raw material supplies should be available. However, in collector systems, a condition of "scarcity" is present as a consequence of tighter scheduling and greater logistical mobility, resulting in greater care in conserving raw material. This pattern should transcend local fluctuations in lithic raw material availability as it is presumably directly related to the adaptive strategies.

The bifacial tools (n=141, Table D-33) collected during the survey were initially analyzed in the same manner as the debitage and flake tools to isolate key variables and the breakdown procedure was used to produce a predicted classification of the four biface types employed. The results of this analysis were inconclusive. Although the discriminmant function analysis structured the number of flake scar variables in descending order of importance, the canonical variates matrix exhibited no highly significant correlations. The absence of strong relation-

ships between and among the independent variables made it extremely different to make group divisions in the breakdown test. The difference of means test (Student's t) was used to compare all pairs of subgroupings. Little success was had in finding significant differences between the populations that were compared. For these reasons, a more conservative grouping was made at the level of the first variable (massive marginal flake scars) ordered by the discriminant function analysis. The relationships of this variable to the three independent variables are illustrated ad dendrograms in Figures E-17, E-18, E-19 and E-20. Each of these figures represents a separate category demarcating significant changes in the occurrence of massive marginal flake scars on each biface type.

It appears that the reason that this analytical strategy was not effective for this class of artifacts was the large number of broken specimens. Therefore, it was decided to analyze this data set using single variables. Maximum thickness was chosen because it is the most useful in examining the degree of biface reduction and the most frequently observed of the size variables for this class, due to the large number of broken specimens.

Comparison of the means and standard deviations of this variable for Aggregate 1, Aggregate 7, Aggregate 8 (prairie) and Aggregate 4 (transitional) appears to confirm the expectations discussed above (see Table 15). Aggregate 1 is situated completely within the forest where forager strategies should be most likely to occur and, consistent with our technological expectations, this aggregate contains the largest and most variable biface assemblage. Aggregate 8 is primarily represented by a prairie association, but the eastern portion of this area is actually transitional to forest. Thickness data indicates that bifaces are slightly more reduced in this aggregate than in the former one. A two sample difference of means test (see Blalock 1972:219-228) verifies that differences between these two biface samples are significant at the .025 level (t=2.00) for a one-tailed test. Had the data from Aggregate 8 been more finely divided into forest and prairie segments, the technological differences would have probably been much more emphasized, as they are in the Tebo Creek aggregate where Stratum 16 extends onto the prairie and Stratum 14 is more clearly in the forest. Here, biface thickness is markedly different as is shown in Table 15 ($\bar{x}$ = 24.00mm) for the forested stratum and $\bar{x}$ = 9.73mm for the grassland stratum. Aggregate 7 (Stratum 23) represents perhaps the clearest prairie association and data on biface thickness is most distinguishable. A difference of means test between this aggregate and Aggregate 1 indicates that the biface assemblage of the former is significantly smaller at a level of .0005 (t=5.00) for a one-tailed test. Aggregate 7 also differs (and is small) from the Aggregate 8 assemblage at the .005 (t=2.85) level of significance for a one-tailed test.

TABLE 15

| | Biface Thickness | | |
|---|---|---|---|
| | n | $\bar{x}$ | s |
| Pomme de Terre (Strata 1, 2, 3) | 61 | 16.01 | 8.10 |
| Upper Osage (Stratum 24) | 58 | 13.26 | 7.20 |
| Middle South Grand (Stratum 23) | 66 | 10.05 | 5.28 |
| Tebo Creek (Stratum 14) | 5 | 24.00 | 5.52 |
| Tebo Creek (Stratum 16) | 11 | 9.73 | 3.69 |

These results closely parallel those reported for the debitage, supporting the contention that more economizing tactics are employed in grassland settings. It is important to emphasize that these differences are detectable eventhough the bulk of the sites being compared are residential in nature and thus well supplied with lithic material. This indicates that there are important differences in the way lithic technologies are organized and manipulated in forest versus prairie residential settlements. Examples of the various sizes and functional applications of bifaces collected during the survey are illustrated in Plates 11 through 14.

**Expedient Cores**

A total of 223 expedient cores were collected during the survey. A discriminant function analysis was used to test the accuracy of a core typology based on directional scar pattern. This variable was referred to as "core type" and consisted of four groups: 0= no directions observable, 1=undirectional, 2= bidirectional and 3= multidirectional. Illustrations of these core types are contained in Plates 15 and 16. A step-wise discriminant function analysis included number of platforms, total platforms, length, average platform length, average platform width, average flake scar area, core length, core width, weight, percent of cortex, presence of battering and total scars. Unweighted stepwise analysis produced the following sequence: number of platforms, total scars, average scar area and average platform width. Continuous variables were ordinated according to the criteria outlined in Table D-34.

Scatterplots (see Figure E-20a, b, c, and d) of the core type groups indicates that this criterion is a fairly good discriminator of the variation contained in the core attributes selected for analysis. The scatterplot of the multidirectional cores suggests that there may in fact be two groups of this type (see Figure E-20c). The upper group appears to coincide with the distribution of undirectional cores. The overall correct classification percentage was 70.10 percent and the greatest success was achieved in the unidirectional group with an 88.2 percent correct classification (Table 16).

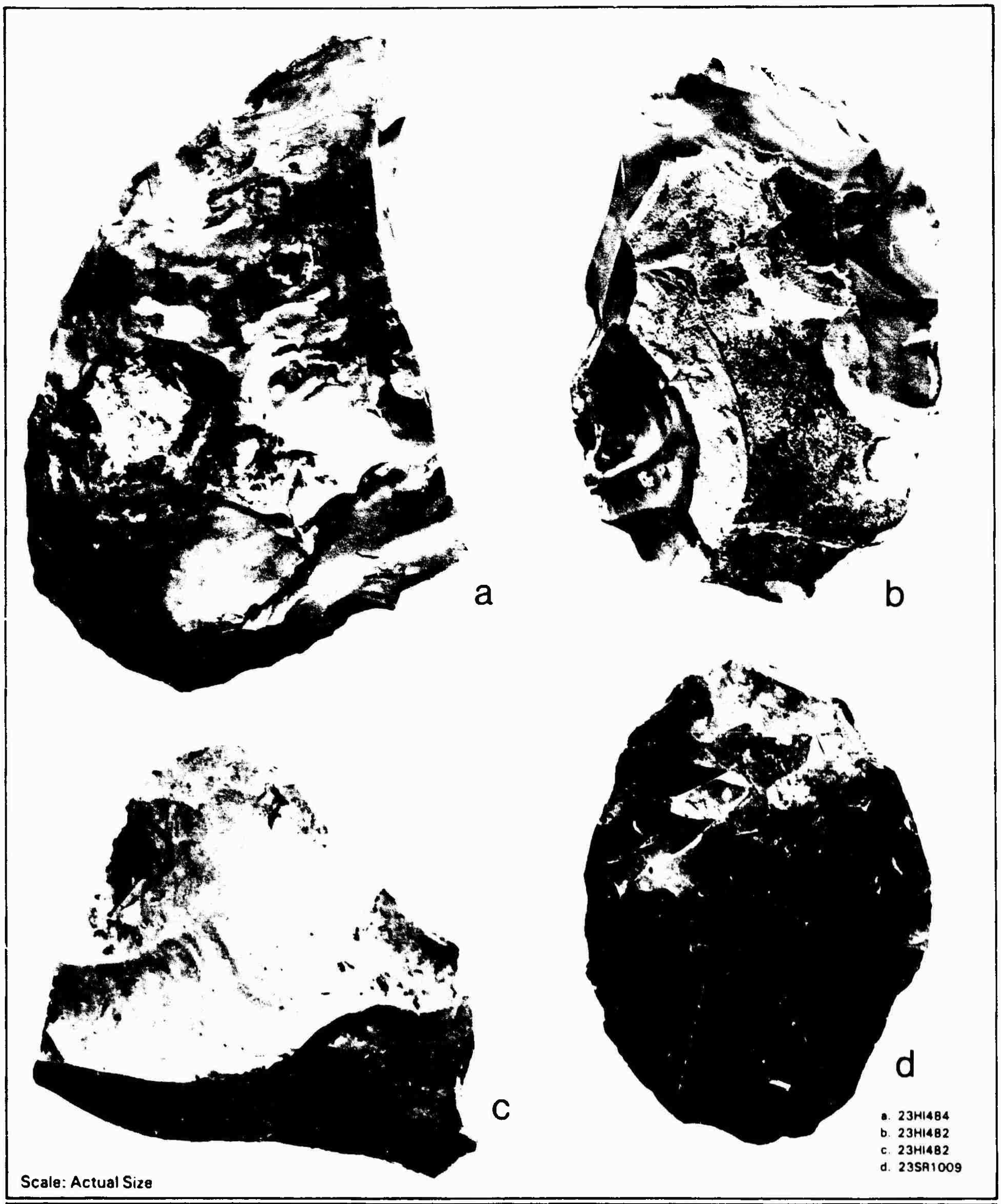



PLATE 11
**EARLY STAGE REDUCTION BIFACES**
HARRY S. TRUMAN RESERVOIR-OSAGE RIVER BASIN
U.S. ARMY ENGINEER DISTRICT-KANSAS CITY, MISSOURI


a. LSR1-1 23HI484
b. LSR1-2 23HE867
c. LSR1-3 23SR1009
d. LSR1-4 23SR1024
e. LSR1-5 23BE1036
f. LSR1-6 23BE1036

Scale: Actual Size

PLATE 12

**LATE STAGE REDUCTION BIFACES**

HARRY S. TRUMAN RESERVOIR-OSAGE RIVER BASIN

U.S. ARMY ENGINEER DISTRICT-KANSAS CITY, MISSOURI


a. LSR2-1 23BE1036
b. LSR2-2 23HI482
c. LSR2-3 23HI484
d. LSR2-4 23SR1024
e. LSR2-5 23BE1036

Scale: Actual Size

PLATE 13
**LATE STAGE REDUCTION BIFACES**
HARRY S. TRUMAN RESERVOIR-OSAGE RIVER BASIN
U.S. ARMY ENGINEER DISTRICT-KANSAS CITY, MISSOURI


a. ADZ1 23HI487
b. ADZ2 23HI484
c. ADZ3 23SR1036
d ADZ4 23SR1036

Scale: Actual Size

PLATE 14
**BIFACES WITH ADZ EDGES**
HARRY S. TRUMAN RESERVOIR-OSAGE RIVER BASIN
U.S. ARMY ENGINEER DISTRICT-KANSAS CITY, MISSOURI


Scale: Actual Size

a. 23HI484
b. 23HI484
c. 23HI484

**PLATE 15**
**UNIDIRECTIONAL CORE AND BIDIRECTIONAL CORES**
**HARRY S. TRUMAN RESERVOIR-OSAGE RIVER BASIN**
**U.S. ARMY ENGINEER DISTRICT-KANSAS CITY, MISSOURI**

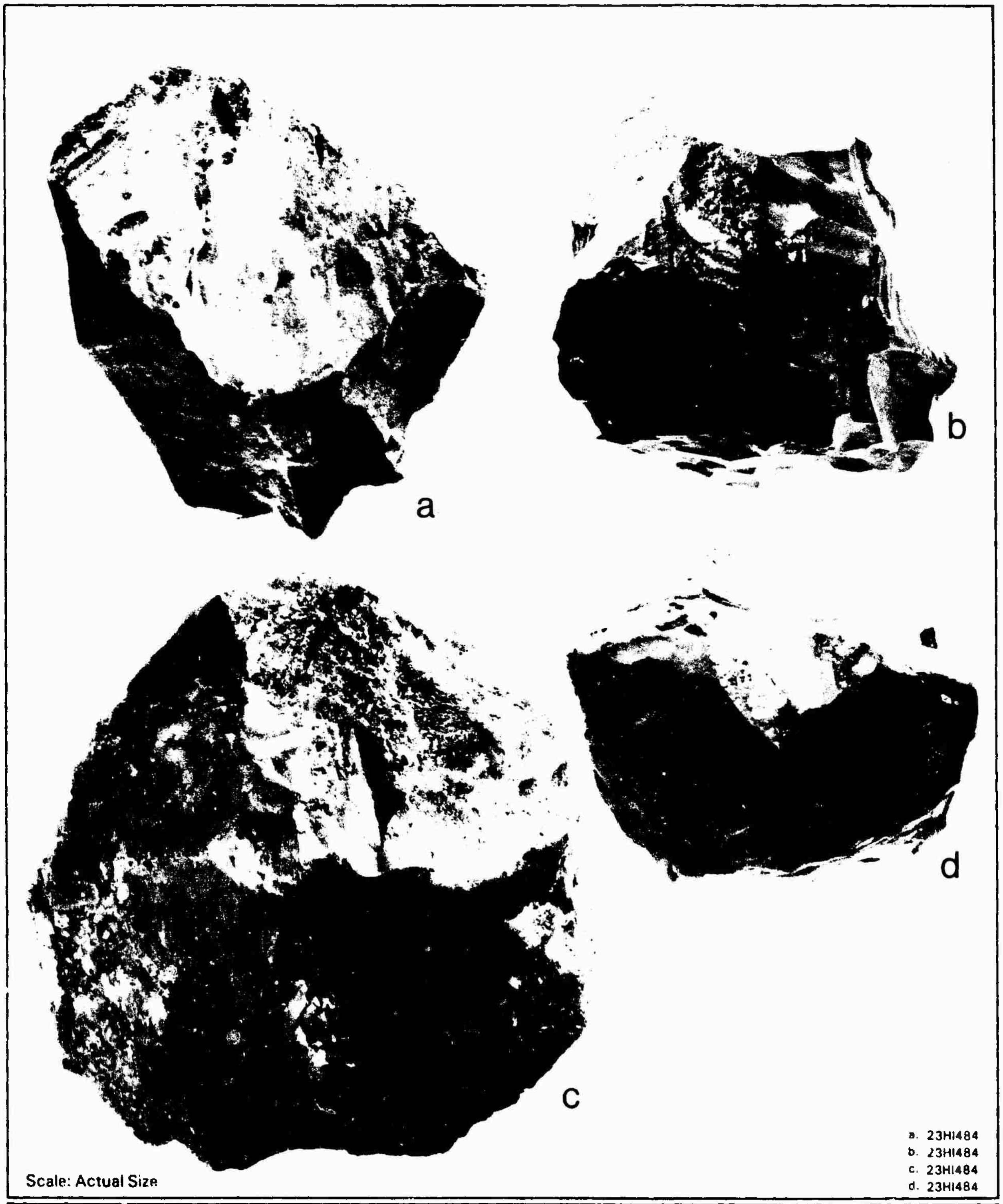



PLATE 16
**MULTIDIRECTIONAL CORES**
HARRY S. TRUMAN RESERVOIR-OSAGE RIVER BASIN
U.S. ARMY ENGINEER DISTRICT-KANSAS CITY, MISSOURI

TABLE 16

CLASSIFICATION RESULTS

| | Actual Group | No. of Cases | Predicted Group Membership 1 | 2 | 3 |
|---|---|---|---|---|---|
| | 1 | 34 | 30 | 4 | 0 |
| Unidirectional | | | 88.2% | 11.4% | 0.0% |
| | 2 | 58 | 11 | 38 | 9 |
| Bidirectional | | | 19.0% | 65.5% | 15.5% |
| Multidirectional | 3 | 112 | 14 | 23 | 75 |

It is tempting to suggest that these three core types reflect a core reduction sequence beginning with unidirectional types. However, the former group, as is indicated in Table D-34, cannot represent the beginnings of this proposed sequence because it is consistently smaller and/or lighter in weight than bidirectional and multidirectional cores. Unidirectional cores most likely represent chunks of raw material that were casually picked up and used to produce a single flake and then immediately discarded. Table 16, on the other hand, indicates that multidirectional and bidrectional cores are more equal in size and weight and it is quite possible that they may be functionally the same core type.

Viewing the distribution of these core types across the aggregates (see Table D-35) indicates that proportional differences between them are not discernible. However, when the total debitage per aggregate is divided by total cores important differences emerge. Aggregate 2 shows an extremely large average number of flakes per core. This data is not ideally comparable to the other strata though, because it was excavated rather than surface collected. Comparing the ratios from aggregates 1 and 8 indicates that the debitage to core ratio is nearly one third greater in the latter aggregate. This indicates more economizing behavior in Aggregate 8 which is an implication of logistical strategies. Rather than necessarily implying a direct functional relationship with expedient cores, though, this increased ratio may indicate greater biface reduction in Aggregate 8, a pattern already noted in the debitage analysis.

## CULTURAL AFFILIATIONS

The identification of diagnostic projectile points by Dr. Donna C. Roper permits the assignment of cultural affiliations to the sites from which these artifacts were recovered. This information is being presented here in two ways. First, in Table 17, cultural affiliations are presented by aggregate for each of the standard cultural-historical periods. The designations were made in the following way. As was noted above in the analysis of the projectile points, many of the diagnostic points occur in more than one cultural-historical period. Table 17 was constructed by assigning one component for each cultural-historical period so represented. The result of this is that a single projectile point may be tabulated with as many as three components. For the discussion below, the designations will be made in a slightly different way. In this section, the designations will be made in

TABLE 17

CULTURAL AFFILIATIONS

| | | |
|---|---|---|
| Dalton | 3 | 1.50% |
| Early-Middle Archaic | 7 | 3.50% |
| Late Archaic | 9 | 4.50% |
| Late Archaic-Woodland | 18 | 9.00% |
| Woodland | 11 | 5.50% |
| Woodland-Mississippian | 5 | 2.50% |
| Unidentified Prehistoric | 147 | 73.50% |
| Number of Components | 200 | 100.00% |

terms of broader cultural complexes. These are Dalton, Early-Middle Archaic, Late Archaic, Late Archaic-Woodland, Woodland and Woodland-Mississippian. It is felt that this manner or presentation better reflects the adaptational complexes present in the study area. No evidence of Paleo-Indian remains was found during the present survey. To date, there has been only one well-documented find and this was in Henry County (Roper 1981d).

### Dalton

Two sites, 23SR1021 and 23BT56, contained artifacts from this cultural period. Roper (1977a) has suggested that the sparseness of Dalton period sites may be due to three reasons. The first is that they simply are rare. The second is that they are buried, and as she notes, this is clearly indicated by the results of both geomorphological studies (Haynes 1976) and the results of deep-testing or the inspection of cut banks (Piontkowski 1977). A total of 17 Dalton period components were previously known from the results of all surveys previously conducted in which over 2000 sites were recorded. Thus the number found during this survey is proportional to the aggregate total.

Because both sites are surface sites, it is not possible to offer any penetrating insights into the nature of the Dalton adaptation. Both of the sites are in the western part of the study area. 23SR1021 is located around a spring that is still active. The location of 23BT56 is less distinctive, being on the first terrace above Panther Creek. This site, unlike 23SR1021, was multicomponent, having artifacts from the Early-Middle Archaic, Late Archaic and Late Archaic - Woodland. The distribution of these sites is illustrated in Figure 22.

### Early-Middle Archaic

Eight sites were assigned to this cultural period based on the presence of diagnostic projectile points such as Big Sandy, Rice-Lobed, Rice Lanceolate and Plains Early Archaic (Category 368-370, Goldberg and Roper 1981). The distribution of these sites is exclusively in the prairie portion of the study area (see Figure 22). This contrasts with the distribution of Early-Middle Archaic sites as they are represented from the Stage I and Stage II surveys. In those surveys, 19 of these sites were located in the forested portion of the study area (Roper 1977).

No bifurcated base or Hardin points were collected. One Rice Lanceolate was collected from 23SR1025. Although fairly common at Rodgers Shelter (Kay 1978b), these are rare in open contexts with only one found during the Stage I and Stage II surveys (Roper 1977a). None were found during the Stage III survey or the survey of the public use areas (Roper, personal communication). Little can be said about the nature of the Early-Middle Archaic adaptation because all of these sites are surface sites with possibly mixed assemblages.

### Late Archaic

A total of nine sites has been assigned to this time period based on the presence of diagnostic projectile points such as Afton, Etley and Nebo Hill. Etley points were found at seven of the sites. Only one Nebo Hill point was found. The distribution of the Etley components accords well with that presented by Joyer and

Roper (1980: Figure 9). The location of the Nebo Hill site, however, is further east and south of that indicated by Joyer and Roper (1980: Figure 1). One Afton point was recovered from a site along the Pomme de Terre (23HI484). In these respects, the distribution of sites is not surprising. A total of 140 Late Archaic sites was recorded during the previous surveys of the reservoir (Roper 1977a; Roper 1981a). This represents approximately 7 percent of the total. The proportion of Late Archaic sites in the present study is less, comprising only 5 percent of the total. Figure 23 displays the locations of these sites.

**Late Archaic - Woodland**

This category has been designated to permit discussion of a number of sites where the diagnostic artifacts occur both during the Late Archaic and Woodland periods. A total of 17 sites was assigned to this category. Projectile points diagnostic of the period include Category 306, Category 302 (Goldberg and Roper 1981), Cooper, Gary, and Standlee. The geographic distribution of these sites is presented in Figure 24.

Roper, in her discussion of the Woodland Period (1981b), suggested that the use of the traditional tripartite division of this stage was not appropriate for the Truman Reservoir. Instead, she has isolated three complexes, based on projectile points, primarily. The first of these is the contracting-stemmed points complex, composed of sites containing Gary and Langtry (Standlee) points. It is largely this complex that is represented by the Late Archaic-Woodland designation here. Seven of the 18 sites assigned to this category have Standlee (6) or Gary (1) points. Also represented here are six sites containing Cooper points.

The seven sites with contracting stemmed points represent 3.89 percent of the sites found during this survey. During the Stage II survey, 4.99 percent of the sites recorded had Gary or Standlee points (Roper 1977a).

The second complex isolated by Roper (1981b) consisted of Snyders points, considered to be diagnostic of the Middle Woodland, although she is careful to note that other diagnostic artifacts (especially ceramics) are lacking from the survey collections. Three sites were found during the present survey that had Snyders points. Two of these (23HI484, 23HI487) are located along the Pomme de Terre in Stratum 1. The third (23SR997) is located along the main trunk of the Osage in Stratum 11. The extremely small sample precludes any meaningful inference about the distribution of these sites (see Figure 29) as all of them are within the range of sites recorded during Stage I and Stage II surveys (Roper 1977: Figure 16).

The third complex isolated by Roper (1981b) is composed of Rice Side-Notched points and arrowpoints such as Scallorn. Some of the corner-notched points may also be a part of this complex, but they are not so considered here, being placed in the Late Archaic-Woodland category based on more recent data in Goldberg and Roper (1981). Eleven sites containing either Rice Side-Notched or arrowpoints (Scallorn, Reed or Fresno) were recorded during the present survey. This distribution of these sites is presented in Figure 25. This comprises 6.11 percent of the sites found. This compares with a total of 115 sites (5.75 percent) of this complex recorded during the Stage I and Stage II surveys (Roper 1977a). Roper notes that sites from this complex are of a number of distinct types. One of these

types is the large scatter which occurs on the terraces along the major rivers. 2HI484 and 23HI487 are examples of this type located during the present survey. Other types include the small scatter, represented here by sites such as 23HE865, and rockshelters, which include the only rockshelter recorded during this survey, 23BE1027.

The preceding discussion of the cultural affiliations of sites recorded during the survey of the Ten-Year Floodpool has demonstrated that all major periods of prehistoric occupation are represented in our sample. The only period missing is Paleo-Indian, and the absence of this is easily explained by sampling error, if nothing else, because only one Paleo-Indian artifact has been found to date in the reservoir (Roper 1981c). This would be 0.05 percent of the total number of sites recorded during the Stage I, Stage II, Stage III and Public Use Area surveys (Roper 1977; Roper 1981a). A comparison of the percentage representations of each major cultural period for the present survey and the Stage I and Stage II surveys indicates that they are quite similar. This fact enhances the representativeness of the present survey as an indication of the characteristics of the total population of sites within the Ten-Year Floodpool.

# VII SUMMARY AND RECOMMENDATIONS

The survey and reconnaissance of lands within the Ten-Year Floodpool reported here located and recorded 180 previously unknown prehistoric archaeological sites. Of this total, 132 of the sites were located on "fee" lands owned by the United States Government; the remaining 48 sites were located on "easement" lands not owned by the government. The amount of area surveyed totaled 16,325 acres, of which 9,040 acres were fee lands and 7,285 acres were easement lands.

Evaluation of these sites indicates that this sample is representative of the resources present in terms of such characteristics as size and setting. Artifact identification and analysis also indicate that each major cultural adaptation is represented within this sample. In addition to providing much needed management information about the number and kinds of sites that might be present within the Ten-Year Floodpool, the goal of this project was to examine the nature of prehistoric adaptations to the Prairie-Forest border. This emphasis was chosen because the present study possessed a geographic scope not available to previous investigators. This goal was approached by examining the Forager-Collector model of hunter-gatherer adaptations (Binford 1980) by developing expectations about the properties of the lithic technological systems used by the prehistoric inhabitants of the region. As was noted above, the expectations of the model were largely met, and, there are observable and measurable differences in the lithic technologies that are geographical in nature and are not the result of chronological cultural-historical differences. Also of interest, is that these differences emerge from the analysis of artifacts from surface-collected sites.

## IMPACT OF THE PROJECT ON PREHISTORIC SITES WITHIN THE TEN-YEAR FLOODPOOL

There are three principal configurations of the Harry S. Truman Reservoir. These are the Conservation Pool, in which waters are impounded to an elevation of 706 feet msl. The second is the Ten-Year Floodpool which impounds water from an elevation of 706 feet msl to 731 feet msl. The third is the Fifty-Year Floodpool, which impounds water to an elevation of 742 feet msl. These latter two are named on the basis of a probability that the reservoir will fill to these levels at least once during the span of time noted. Within the Ten-Year Floodpool, there will be (and have been) seasonal or more frequent fluctuations of the level of the reservoir to elevations below the 731 foot level. As a result, the degree of impact on sites within the Floodpool will be primarily a function of their elevation. This general view is complicated by the location of the site within the study area. Table D-36 presents the low and high elevations of sites by stratum for sites recorded during this survey. The elevations of previously recorded sites are presented in Appendix D Table 1.

The natural dynamics of a river system such as the Osage entails periodic flooding of varying intensities. In fact, it is this property of the river system that caused the project to be proposed and built. Because of this, periodic flooding need not be necessarily considered to an adverse effect if the site is located where it would be subject to such flooding as a result of the natural operation of the river. For this reason, it is necessary to consider the location of the site within the study

area. For example, in the fee lands, sites located in Strata 2, 12, 13, 17, 18 are mostly located at elevations that would not have been subject to flooding prior to inundation of the Conservation Pool. Conversely, sites located in Strata 1, 6, 7, 10, 16, 19, 20, 21 are at elevations subject to natural flooding. This is also true of all but the highest elevations of the easement lands of Strata 23 and 24. What has changed in the areas of the Ten-Year Floodpool that were subject to natural flooding is the frequency of inundation because the level of the Conservation Pool creates an artificial base level of 706 feet msl from which flooding then begins.

The extent of damage or erosion caused by flooding would depend on the amount of groundcover on the area flooded. In the fee lands, most of the Ten-Year Floodpool is being revegetated due to the absence of agricultural activity. Exceptions to this are those lands within the Ten-Year Floodpool that are being used as Public Use Areas (not covered by this survey) and Wildlife Management Areas. The latter would be subject to increased erosion at certain times of the year if flooding occurred while these areas were freshly plowed.

Sites located on the shoreline of the reservoir will also be subject to damage from the mechanical effects of the water on the shoreline. In some instances, this can be very serious because the erosion keeps occurring, and large portions of the site area can be eroded away.

Impacts to sites in the easement lands will be primarily due to flooding and its mechanical effects. The severity of these effects will depend on when the flooding occurs during the agricultural cycle in those areas under cultivation. In the forested or pastured areas of the easement lands, there should be relatively few, if any, mechanical effects. It should be noted that the inundation of the Ten-Year Floodpool will occur by water backing up from the gradual change in the elevation of the floodpool. The mechanical effects of this are different from natural flooding, which may be accompanied by swiftly moving waters causing channel cutting and other large scale erosion.

In some respects, impacts to sites in the easement lands may be reduced by the undertaking. The perpetual flowage easements obtained by the government prohibit human habitation and require government approval for the construction of any structures. Agricultural use of the area is permitted to continue, but this was an activity that occurred prior to reservoir construction. For these reasons, it can be said that the project will cause few, if any, adverse impacts to prehistoric resources within the easement area.

The Scope of Work calls for suggestions to be made concerning the inspection of the reservoir shoreline due to the mechanical effects of the waves. It is our opinion that these inspections be conducted in areas where known sites occur and in those areas where the probability of encountering sites is high. For the study area, this means the first terraces of the major rivers and their tributaries. These areas are inundated close to the dam site, so it is suggested that these areas be assigned a low priority. Specifically, these areas include all of Stratum 13, and parts of Strata 2, 3, 4, 11, 12, 17 and 18. High priority areas would be Strata 1, 4, 5, 6, 8, 9, 10, 11, 16, 19, 20, 21, 22. All of these have substantial amounts of terrace lands immediately above the level of the Conservation Pool. Coincidentally, these areas are the ones with the highest site densities (generally) within the study area.

Three kinds of sites are likely present in the unsurveyed portion of the Ten-Year Floodpool. These are the open site, which consists of a scatter of artifacts, either on the surface or buried, the rock shelter and the burial mound. Of the three types, the open site is the only one with a high probability of being encountered in both the fee and easement lands. Additional rock shelters can be expected to occur in the fee lands, and, possibly, in the easternmost part of Stratum 24. It is unlikely, given the lay of the land and the boundaries of the study area, that rock shelters are present along the South Grand or Deepwater Creek in Stratum 23. If mounds are present, they will be of the kind that occur in floodplain situations and not those associated with the Fristoe Burial Complex (Wood 1967). The reason for this is primarily that the study area does not have any high bluff tops of the sort that were used for mounds of the Fristoe Burial Complex. Based on the results of the University of Missouri's Stage I and Stage II surveys, the probability of finding any mounds is very slight.

## RECOMMENDATIONS

In this section, the relative significance of the sites and recommendations for further work in the Ten-Year Floodpool will be discussed. Due to differences in the ownership of the lands within the Ten-Year Floodpool, the discussion will be in two parts, for the fee lands and, then, for the easement lands.

### Evaluation of Significance

The fee lands within the Ten-Year Floodpool are located within the Archeological District of the Harry S. Truman Dam and Reservoir Multiple Resource Area. As a result, all sites found are eligible by virtue of their being located on these lands. Because of this, recommendations are offered below based on each site's potential to contribute significant data to the three major domains of significance. These have been discussed by Roper (1981b:3-40). They are the study of the chronology of adaptations, the nature of the settlement systems and the cultural continuity of the last 2500 years of the prehistory of the reservoir. In making our evaluations and recommendations, we utilized two lines of evidence. The first of these was site content. Were the artifact types necessary to study a problem present? If so, were they present in sufficient quantities? The second reflects on this last question. Site survey, testing and evaluation by the University of Missouri in the reservoir has indicated that many of the sites are very small and that many of the sites located on the surface in alluvial settings are, in fact, restricted to the plowzone. Both of these aspects of sites were noted in the sample of sites found during this survey.

Also recognized in the development of these recommendations was the fact that useful data collected during the surface collections are the major means of documenting these sites. This is to say that surface collection is an effective means of mitigation of research values that may be present on some sites.

The first major domain of significance employed here is chronology of adaptations within the study area. The study of this problem requires sealed, undisturbed contexts within stratified sites that will permit the development of a relative chronology. More important, however, are deposits that can be dated either by the radiocarbon means or by thermoluminescense, as was employed by the

University of Missouri. Very few of the sites found during this survey will contribute to this study. The only possible exception to this would be if there were unambiguous horizontal segregation of cultural-historic diagnostics in undisturbed contexts in some of the large terrace sites.

The second domain is the delineation of settlement systems of the various adaptations that were utilized by the prehistoric inhabitants of the study area. Because of the surface context of the sites reported here, this sample of sites will most likely inform on those adaptations and settlement systems of the last 3000 years.

The third domain is indirectly related to the second above. This is the study of the apparent cultural continuity that characterized the archeological record of the last 2500 years of the project area. At issue here is the cause or causes of the long-term persistence of artifact types which bridge standard taxonomic units and the absence or near absence of artifact types indicative of major taxonomic subdivisions of the eastern United States such as the Early and Middle Woodland, or the Mississippian. Roper (1981b) rightly seizes on this aspect of the archeology as one problem which has major import for not only regional studies but on a national level. For her explanation, she argues what might be called the "country cousin" analogy. This suggests that the Ozarks have always been marginal to the adaptations in the major river valleys, which would be centers of innovation. Very few of these innovations would reach the Ozarks and be incorporated into the material culture. This is viewed by her as conservatism. We would suggest that this apparent cultural continuity is a reflection of large scale functional differences in which the landscape was used. The basis of this would be that the Ozarks were used on a seasonal basis by the various demographic groups that utilized the area. The cultural continuity that is observed is the result of this seasonal adaptation of the Ozarks being an effective one. At other times during the seasonal round, these groups might make and use the material culture that is considered to be typical of one of the major taxonomic units. For example, consider the distribution of the Big Bend Hopewell sites reported by Kay (1978). What is of interest is that all of these sites have a restricted geographical distribution and can be characterized as base camps based on artifact inventories, presence of houses and evidence of storage. Is the Middle Woodland adaptation here a completely sedentary one? Where are the rest of the Middle Woodland sites? It could be possible that these same groups who occupied the Big Bend sites were seasonally utilizing parts of the study area, but whose presence is marked only by the occasional Snyders point because the activities that they performed while in the study area did not require the manufacture and use of items that are considered diagnostic of the Middle Woodland. The answers to these questions will not be found here, but continued study of the archeological record may shed light on them.

**Fee Lands**

The present survey located 132 sites within the fee land portion of the Ten-Year Floodpool. Combined with the 563 previously known sites, there are presently 695 sites known within the Ten-Year Floodpool. According to survey coverage estimates made for the Stage I and Stage II surveys, there were 9575 acres surveyed. Combined with the acreage surveyed during this survey, it is estimated that 18,615 acres of the fee land portion of the Ten-Year Floodpool has been

surveyed. Given the estimated total acreage of 60,000 acres for this portion, approximately 31.03 percent of the study area has been surveyed. Above, it was estimated, based on results of this survey and the Stage II survey, that there were between 900 and 1350 sites within the fee land portion of the Ten-Year Floodpool. These estimates are lower than those that would be obtained if the area surveyed was divided by the number of sites found. This method would yield an estimate of over 2100 sites. The discrepancy between these estimates can be explained by the fact that the Stage I survey purposely covered areas of both high surface visibility (plowed and cultivated fields) and high probability for having sites (terraces).

These surveys have demonstrated that there is a high density of sites with the Ten-Year Floodpool and that these sites tend to be located on terraces associated with the major rivers and streams and their tributaries. On this basis, terraces can be considered to be areas of high sensitivity for the presence of prehistoric resources.

With regard to additional survey of the study area, it is recommended that, at this time, there is no immediate need for any large scale systematic survey of the remaining fee lands in the study area. The results of the three surveys conducted to date are broadly comparable in terms of both the number and kinds of sites found. Further large scale effort is likely to be redundant and expensive. It is recommended that shoreline inspections be conducted in areas of known high site density to determine the impact to these resources. In addition, survey should be conducted in previously unsurveyed areas whenever any facility construction is planned.

**23BE1018**

No further evaluation of this site is necessary. The only artifacts found at this site came from a cut bank formed by the unnamed intermittent stream which borders the site. In order to determine site boundaries, ten shovel tests were excavated. No other artifacts were found. This indicates that the site is of very low density or that it has been eroded away by the stream.

**23BE1019**

No further testing of this site is warranted. The site area has been extensively disturbed by bulldozing incidental to the demolition of structures in the area. Both surface collection of disturbed areas and shovel testing of vegetated areas failed to yield diagnostic artifacts and only one tool, a biface. The shovel testing also indicated that the depth of the soil here was 10 cm or less.

**23BE1020**

It is recommended that this site be evaluated further should it be threatened by any activities associated with the operation of the reservoir with the exception of the use of this area for wildlife management. There is a dense scatter of artifacts here and a wide variety of artifact types are present in the surface collection, including two diagnostic bifaces, an Etley (Category 339) and a Category 325. These indicate that the site was occupied during the Late Archaic and the Middle-Late Woodland periods. Should testing become necessary, a dispersed sample of test units should be excavated to determine if undisturbed

deposits are present below the plowzone and the horizontal extent of such deposits. This site is located very close to the edge of the conservation pool, and, as such, could be subject to mechanical effects of wave action during periodic inundations of the site as the reservoir level fluctuates to accommodate floodwaters.

**23BE1021**

No further work is recommended for this site. A controlled surface collection has resulted in a representative sample of artifacts from the site. The absence of diagnostic artifacts here indicates that there would be little chance of placing this site within a settlement system.

**23BE1022**

Additional testing of this site is recommended if it is threatened by any reservoir operational activities. An extensive, intensive controlled surface collection indicates that the site possesses data that will contribute to the delineation of settlement patterns in the study area. An Etley point was recovered during the surface collection which indicates a Late Archaic occupation of the site. If testing indicates undisturbed deposits and, if a single component is present, these data may shed light on the differential distribution of Etley and Nebo Hill sites. Analysis of associated materials may indicate whether or not these differences are functional or that the sites are produced by different demographic populations. The site should also be monitored periodically to determine if it suffers adverse impacts due to periodic inundations by the reservoir.

**23BE1023**

No further work is recommended for this site. Debitage was the only artifact type recovered during shovel testing, which also indicated that artifacts were only present in the plowzone.

**23BE1024**

No further work is recommended for this site, which is a very sparse unidentified prehistoric lithic scatter. Shovel testing indicated that artifacts are restricted to the plowzone here. This fact, and the absence of diagnostic artifacts, indicates that this site has little potential for contributing to any regional research problems.

**23BE1025**

No further work is recommended for this site. The low density of artifacts recovered by shovel testing, and the fact that only debitage was present means that this site has little potential to contribute significant data to any regional or local research problems.

**23BE1026**

No further work is recommended for this site. A sparse lithic scatter, found during shovel testing, contained no diagnostic artifacts. Flakes were the only

artifact type recovered. These facts suggest that this site has little potential to contribute significant data to regional research problems.

**23BE1027**

This site is a multi-locus one, containing both a rockshelter and an extensive lithic scatter. The rockshelter is undisturbed, an assessment based on the excavation of two test units, one inside and one outside the drip line. The deposits contained roof fall and large amounts of artifactual material, primarily debitage. Hafted bifaces recovered during this test suggest that the site may be stratified and that both a Late Archaic and a late prehistoric occupation in the upper 100 cm of deposit. The test pits were only 100 cm in depth due to the fact that these units were placed in order to determine whether or not the site had been disturbed. These tests indicated that the deposits are undisturbed. Because sterile zones were not reached, the potential for material earlier than Late Archaic is excellent. It is our recommendation that every effort be made to preserve this site and that any further work be only as a last resort. Given that all of the other rockshelters from the project area have either been vandalized or tested and excavated, this site is unique as a data bank. It would be good if this site could be monitored very closely by Corps personnel to prevent any vandalism from occurring.

**23BE1028**

No further work is recommended for this site, which is a sparse lithic scatter which contains no diagnostic artifacts. Shovel testing did not yield artifacts, but did indicate that the depth of the soil here is less than 10 cm in depth.

**23BE1029**

No further work is recommended for this site. Shovel testing here indicated that the site was both small and sparse. The absence of any diagnostic artifacts suggests that this site has little potential for contributing significant data to any regional research problems.

**23BE1030**

No further work is warranted at this site. No diagnostic artifacts were found and shovel testing indicated that very little soil (less than 5 cm) was still left on the site. These facts indicate that this site has little potential for contributing to local or regional research problems.

**23BE1031**

No further work is warranted at this site. Shovel testing indicates that the deposit is thin soil over rocks. Surface collection of open and disturbed areas yielded only flakes. As such, the site has no potential to contribute significant data.

**23BE1032**

No further work is necessary for this site, which is a sparse lithic scatter located in a disturbed area. Shovel testing indicated that the soil here was thin and rocky. No diagnostic artifacts were found. Because of this, there is little chance that this site can contribute significant data to any regional research problems.

**23BE1033**

No further work is needed at this site, which is located in a disturbed area. An intensive inspection of the ground surface resulted in the collection of only two flakes. Shovel testing indicated that the depth of the soil here was less than 10 cm.

**23BE1034**

No further work is recommended for this site. Although there is a medium density of artifacts present here, no diagnostic artifacts were found. In addition, it appears that some part of the site lies permanently inundated under the multipurpose pool (706 feet a.s.l.). For these reasons, it appears that it is not now possible to retrieve a representative sample of artifacts with which to test or evaluate any research problems.

**23BE1035**

No further work is recommended for this site. The absence of diagnostic artifacts and the presence of only debitage in the surface collection makes it likely that this site has little potential to contribute significant data to any regional research problems.

**23BE1036**

Testing of this site is recommended if it becomes threatened by any reservoir operational activities. There is a wide variety of artifact types present, including some hafted bifaces which cannot be placed into the Goldberg and Roper (1981) typology. Testing and further investigation could result in data that could shed light on the functional, cultural and temporal associations of these hafted bifaces. In addition, this site is located along a secondary tributary of the South Grand River, and more intensive investigation could shed light on the nature of site type variability in this portion of the study area.

**23BE1037**

No further work is recommended at this site. A surface collection of the site yielded only debitage. The absence of diagnostic artifacts and the sparseness of the scatter gives this site little potential to contribute significant data to any regional research problems.

**23BE1038**

No further work is recommended at this site. No diagnostics are present and only flakes were recovered in the surface collection in spite of excellent ground

surface visibility. The sparseness of the scatter and the lack of variety of artifact types suggests that this site has little potential to contribute significant data to any regional research questions.

**23BE1039**

No further work is recommended for this site because only one artifact was found in spite of an intensive program of shovel testing after the initial find was made. Dense pasture grass made a surface collection impossible.

**23BE1040**

No further work is recommended for this site. The absence of diagnostic artifacts and the presence of only flakes in the surface and subsurface tests indicates that this site has little potential to contribute data to significant reseach problems.

**23BE1041**

No additional work is warranted for this site. Subsurface testing here yielded only debitage in three of twelve tests. This indicates a low density of artifactual material. This fact and the fact that artifacts were restricted to the plowzone suggests that this site has little potential to contain significant data.

**23BE1042**

This site should be considered to be potentially eligible and should be tested to evaluate its potential if it should be further impacted by reservoir operational activities. Shovel testing indicated that there is a medium density of artifacts present. In addition, two corner-notched hafted bifaces were found. These were classified as Category 364, heavily damaged corner-notched points after Goldberg and Roper (1981). The relatively large area of the site (given that it was shovel tested) suggest that this site may be some sort of short-term residential locus. If so, then data from this site could meaningfully contribute to the delineation of settlement patterns along the South Grand River.

**23BE1043**

No further work is recommended for this site. The absence of diagnostic artifacts and the fact that the artifacts are restricted to the plowzone gives this site little potential to contribute significant data.

**23BE1044**

No further work is recommended for this site. Although a large number of shovel tests contained artifacts, there were only one to two artifacts per test. Secondly, the artifact inventory consisted of only flakes, debitage and chunks. No diagnostic artifacts are present. For these reasons, this site has little potential to contribute significant data.

**23BE1045**

Testing of this site is recommended if it becomes impacted by reservoir operational activities. Results of the surface collection and shovel testing indicate that there is a high density of artifacts present. In addition, hafted bifaces, bifaces and a uniface were recovered. Two of the hafted bifaces recovered could not be accommodated by the Goldberg and Roper (1981) typology but were considered to be potentially diagnostic. If testing indicates that undisturbed deposits are present, then further investigations may shed light on the cultural and temporal associations of these forms. These data would have the potential for contributing to our understanding of settlement-subsistence systems in the study area.

**23BE1046**

No further work is recommended for this site, although a medium density of artifacts was indicated by the shovel testing. This procedure also demonstrated that the site area is in a non-alluvial setting and that the remaining deposits here are very shallow, less than 30 cm. These facts, plus the absence of any diagnostic materials, gives this site little potential to contribute significant data.

**23BE1047**

The results of our investigations here indicate that no further work is necessary. Shovel testing indicated both a low density and low variety of artifacts were present. All artifacts were restricted to the plowzone. These facts and the absence of any diagnostic artifacts suggests that this site has little potential to contribute significant data.

**23BE1048**

No further work is recommended for this site. Shovel testing indicated that the deposits here were very shallow (less than 10 cm). Flakes were the only type of artifact recovered, suggesting that this site has little potential to contribute significant data.

**23BE1049**

No further work is recommended for this site. Although a medium density of artifacts is present, the shovel testing also indicated that the depth of the deposits is very shallow and that the artifacts are distributed in the plowzone. No diagnostic artifacts were found. Because of this, it is not likely that this site can contribute significant data.

**23BE1050**

No further work is recommended for this site because the shovel testing indicated that the depth of soil remaining varied from 0 to 20 cm. A high density of artifacts is present, but the disturbed context and lack of undisturbed deposits suggests that this site has little potential to contribute significant data.

23BE1051

No further work is recommended for this site. Shovel testing here indicated that the depth of the soil was less than 20 cm and that the density of artifacts is low. No diagnostic artifacts were found. This suggests that there is little potential for this site to contribute significant data.

23BE1052

No further work is recommended for this site, which occurs on a heavily eroded ridge slope. Only two artifacts were found on the surface and shovel testing to determine site boundaries failed to recover any additional artifacts. Therefore, this site has little potential to contribute significant data.

23HI478

No further work is recommended for this site. Shovel testing here indicated that there is both a low density and low variety of artifacts present. In addition, no diagnostic artifacts were found. This suggests that the site has little potential to contribute significant data.

23HI479

It is recommended that this site be tested should it be threatened by any activities associated with the operation of the reservoir, including the effects of periodic inundation. The relatively small size of the site (30 meters in diameter) in conjunction with the presence of diagnostic artifacts indicating a Late Archaic-Woodland occupation suggest that, if undisturbed deposits are present, data from this site can contribute significantly to the general problem of Late Archaic-Woodland settlement patterns in the project area. It is also recommended that this site be monitored periodically to determine if it is being adversely effected by mechanical effects associated with periodic inundation.

23HI480

Testing of this site is recommended if it should be threatened by impacts from the operation of the reservoir. Shovel testing of this site indicated that there is a medium density of artifacts present. Although no diagnostic bifaces were found, utilized flakes, unifaces, and a biface were found. This indicates a variety of artifact types are present. If testing should indicate that undisturbed deposits are present, then this site has potential to contribute significant data to the problem of the delineation of prehistoric settlement patterns along the Pomme de Terre River.

23HI481

No further work is recommended for this site. Although surface collection conditions were excellent, neither the controlled collection or surface inspection resulted in the recovery of any diagnostic artifacts. In addition, only two bifaces were found, suggesting that artifact diversity is low and that this site may have been a lithic processing area. The inability to place this site into a cultural-historical framework, however, inhibits the value of these data to inform us on the

nature of settlement-subsistence systems of the study area or the problem of cultural continuity during the last 2500 years of prehistory in this area.

**23HI482**

Testing of this site to determine if undisturbed deposits are present is recommended if this site is impacted by activities associated with the operation of the reservoir. A controlled surface collection resulted in the recovery of a large volume of debitage and a large number of cores and bifaces. A Category 309 hafted biface was found. This indicates a Woodland occupation for the site. The artifact content here, especially the cores and bifaces suggest that this site is a lithic processing area, with raw materials being obtained from the bed of the Pomme de Terre River. If undisturbed deposits are present, then this site has the potential to yield significant data concerning patterns of raw material procurement and processing during the Woodland period along the Pomme de Terre River. Such knowledge is valuable for the study of settlement-subsistence systems in the project area. The site should be monitored periodically to determine if it is being affected mechanically by periodic inundation.

**23HI483**

It is recommended that this site be tested if it is threatened by any activities associated with the operation of the reservoir. The artifact inventory at this site includes two Truman Broadblade points, indicative of occupation during the generalized Late Archaic-Woodland periods. Should undisturbed deposits be present here, they may contain data which can inform on the nature of the adaptation associated with the Truman Broadblade. Such data would be a significant contribution to the resolution of the question of the nature of the generalized Late Archaic-Woodland occupation and cultural continuity in the study area. The site should be monitored periodically to assess whether or not it is being subjected to mechanical effects associated with periodic inundation.

**23HI484**

This site should be tested if it is threatened or affected by any activities associated with the operation of the reservoir. This site is quite large, extending over an area 150 meters by 365 meters. An intensive, controlled surface collection resulted in the recovery of a wide variety of hafted bifaces, cores, bifaces, unifaces and debitage. The diagnostic artifacts here indicate occupation during the Late Archaic (Category 335; Afton, Etley), Middle Woodland (Snyders) and Late Woodland (Rice Side-Notched, Gary). In addition to these, a number of hafted bifaces considered to be potentially diagnostic were found. Should undisturbed deposits be present, then this site has the potential to yield data that would contribute to the delineation of settlement patterns during the later prehistory of the study area. Of interest would be a determination of whether or not there is horizontal segregation of the assemblages from the various cultural-historical periods represented. If such were to be the case, then a comparison of these various assemblages would permit an evaluation of the changes of how the landscape was used at a single location through time. This, of course, would be helpful in addressing the two major research questions: the delineation of subsistence settlement systems and those factors which conditioned the apparent

cultural continuity observed over the last 2500 years in the study area. The site should also be monitored to determine if it is being effected by mechanical effects associated with periodic inundation.

**23HI485**

No further work is recommended for this site. Shovel testing here indicated areas within the site with high artifact densities, but also that the depth of the deposit here was very shallow. The disturbed condition of the site, in conjunction with a low variety of artifact types and no diagnostics gives this site little potential to contribute significant data.

**23HI486**

It is recommended that this site be revisited when not planted in crops in order to get a more accurate estimate of site size and content. This was not done during this survey because this area had already been planted in wheat at the time of our visit. Based on its location, this site may have potential.

**23HI487**

It is recommended that this site be tested if it is threatened by any impacts associated with the operation of the reservoir. A controlled surface collection recovered a wide variety of hafted bifaces, including Afton, Standlee, Rice Side-Notched, Waubesa, Scallow, Reed and Truman Broadblade. This indicates occupation of the site from the Late Archaic to the Late Woodland. In addition, hafted bifaces which could not be accommodated to the Goldberg and Roper (1981) typology were found. These were considered to be potentially diagnostic. The balance of the artifact inventory consists of primarily debitage and utilized flakes, with very few cores or other bifaces represented. This assemblage contrasts strongly with the assemblage from 23HI484 discussed above, which contained large numbers of core and other bifaces. These differences strongly suggest functional differences in the uses of these locations during the entire period of their occupation. If undisturbed deposits are present and if there is horizontal segregation of assemblages (which is suggested by the surface collection), then this site has the potential to yield data that can inform on the three major research questions: chronology, settlement patterns and cultural continuity. In terms of chronology, it might be possible to refine further the range of occurrence for some of the rarer types that occur here, such as Waubesa. Does this point type occur only during a limited range of time here in the study area, or does it have a wider temporal range? Study of this site would also contribute data to the problem of delineation of settlement patterns in the study area in general and along the Pomme de Terre in particular: the study of apparent cultural continuity could be examined from this site. The sample of diagnostic artifacts indicates occupation of the site during the critical period of time, and study of the assemblages associated with these various diagnostic artifacts could permit evaluation of the similarities and differences that might be obtained during different parts of this 2500 year period. This site should be periodically monitored to assess whether or not it is being impacted by mechanical effects associated with periodic inundation.

**23HE865**

No further work is recommended for this site. The presence of both Early Archaic (Category 368), Late Archaic (Etley) and Woodland period (Category 309) hafted bifaces in surface context indicates that there is little chance that undisturbed deposits are present here.

**23HE866**

No further work is recommended for this site. The distribution of artifacts on the surface was sparse and a total pickup of all visible material was made. It was also clear that the artifacts were restricted to the plowzone here.

**23HE867**

No further work is recommended here due to a low density of artifacts and the fact that they are restricted to the plowzone here. This lack of context suggests that the site has little potential to contribute significant data.

**23HE868**

No further work is recommended for this site because it lacks diagnostic artifacts and the surface distribution of artifacts was very sparse (.01 artifacts per square meter). This suggests that the site has little potential to contribute significant data.

**23HE869**

No further work is recommended for this site which consists of a total of eight flakes in an area 20 meters by 20 meters.

**23HE870**

It is recommended that this site be tested if it becomes threatened by any impacts from activities associated with the operation of the reservoir. Should testing indicate that undisturbed deposits are present, then this site has the potential to contribute data useful for the delineation of settlement patterns in this part of the study area. In more specific terms, this would require an analysis similar to the one conducted during this study to assess the degree of logistical versus residential mobility that is evidenced by attributes present in the lithic assemblage. The recovery of diagnostic cultural materials during the testing would also facilitate this approach. Only three sites along Tebo Creek yielded culturally diagnostic materials during the survey, so that to increase our knowledge of settlement patterns here we will have to depend on the study of data from sites that initially may not have diagnostic artifacts. This site should be monitored to assess any impacts from mechanical effects associated with periodic inundation.

### 23HE871

No further work is recommended for this site due to the absence of diagnostic artifacts and low artifact density. It also appears that the artifacts are restricted to the plowzone here.

### 23HE872

No further work is recommended for this site because both the artifact density and diversity are low here (only flakes were recovered). This suggests that the site has little potential to contribute significant data.

### 23HE873

No further work is recommended for this site. The sparseness of the artifact distribution and the fact that the artifact inventory was almost exclusively flakes and debitage suggests that this site has little potential to contribute significant data.

### 23HE874

It is recommended that this site be tested if it becomes threatened by activities associated with the operation of the reservoir. The presence of diagnostic artifacts here (Rice Side-Notched) is rare for sites in the Tebo Creek region. Although the artifact density is low and very few artifact types are present, this site does have the potential (if undisturbed deposits are present) to contribute data to the general problems of the delineation of settlement patterns and the investigation of those factors which condition the cultural continuity observed in the study area from the Late Archaic period to the late prehistoric period. This site should also be monitored periodically to determine if it is being adversely affected by mechanical effects associated with periodic inundation.

### 23HE875

This site should be tested if it is impacted by any activities associated with the operation of the reservoir. A controlled surface collection of a portion of the site surface (the rest was in wheat) resulted in the recovery of a wide variety of artifact types, although no diagnostic artifacts were present. If undisturbed deposits are present, then this site has the potential to contribute data useful to the study of settlement patterns. Data from this site would be valuable because the site is located on Barker Creek which is a tributary to Tebo Creek. Study of data from this locale would permit an evaluation of how lower ranked tributaries are exploited. The site should also be monitored to see if it is being affected by any mechanical effects resulting from periodic inundation.

### 23HE876

No further work is recommended for this site. The sparseness of the artifact scatter here (.002 artifacts per square meter) and the absence of diagnostics makes it unlikely that this site can yield significant data.

### 23HE877

No further work is recommended for this site. The absence of diagnostics and the sparseness of the scatter suggest that there is little potential for this site to yield significant information.

### 23HE878

No further work is recommended for this site. Shovel testing here indicated that the artifacts were restricted to the plowzone. This and the paucity of artifacts recovered suggest that this site is unlikely to contain significant data.

### 23HE879

No further work is recommended for this site. Although a Fresno point was found here, indicating a Late Woodland occupation, the depth of the soil here is less than 20 cm, making it highly unlikely that undisturbed deposits are present.

### 23HE880

No further work is recommended for this site. Shovel testing indicated that the depth of the soil here was less than 20 cm making it very unlikely that undisturbed deposits are present.

### 23HE881

No further work is recommended for this site. The sparseness of the artifact scatter, the absence of diagnostic artifacts and the fact that the depth of the soil here is about 20 cm suggest that this site has little potential to contribute significant data.

### 23HE882

No additional work is recommended for this site because it is an isolated find of one broken biface.

### 23HE883

It is recommended that this site be tested if it is threatened by any impacts resulting from activities related to the operation of the reservoir. Although the artifact inventory here is limited to utilized flakes, debitage and one hafted biface, the site has potential to contribute data to the general problem of the nature of prehistoric settlement patterns. This is because the hafted biface found here could not be accommodated by the Goldberg and Roper (1981) typology, and was considered to be potentially diagnostic. If undisturbed deposits are present, then it may be possible to shed light on the cultural and temporal aspects of this point. Or, it may be indicated that this is a unique form. In any event, the site may contain data that will permit an evaluation of how tributaries along the South Grand are exploited. This site should also be monitored to determine if it is being affected by mechanical effects associated with periodic inundation of the site.

23HE884

No further work is recommended for this site. The site is a sparse scatter in an area where the depth of the soil is less than 15 cm, making the presence of undisturbed deposits unlikely.

23HE885

No further work is recommended for this site. The artifact scatter here was very sparse (density = .01 artifacts per square meter) and the depth of the soil here indicates that there are no undisturbed deposits present. For these reasons, this site has little potential to yield significant data.

23HE886

No further work is recommended here due to the fact that this site is an isolated find.

23HE887

No further work is recommended for this site because it is an isolated find.

23HE888

No further work is recommended for this site. The artifact scatter is very sparse and consists entirely of flakes and debitage. This makes it highly unlikely that the site contains significant data.

23HE889

No further work is recommended for this site. The distribution of artifacts is very sparse and the shovel testing here indicated that the artifacts are restricted to the plowzone.

23HE890

No further work is recommended for this site due to the sparseness of the artifact scatter and the absence of any culturally diagnostic artifacts. This suggests that it is not likely that this site will yield any significant information.

23HE891

No further work is recommended for this site due to the sparseness of the scatter and the absence of diagnostic artifacts. This indicates that the site has little potential to yield significant data.

23HE899

It is recommended that this site be tested to determine if undisturbed deposits are present, if it should be threatened by activities associated with the operation of the reservoir. Although no diagnostic artifacts were found, the

artifact inventory here is varied. Further study of this location could shed light on the nature of settlement patterns along the South Grand near the transition from the forest to the prairie. This site should be periodically monitored to see if it is being adversely affected by mechanical effects associated with periodic inundation.

**23HE900**

This site is not located within the Ten-Year Floodpool, so no artifact collection was made. For this reason, no recommendation will be offered.

**23HE901**

No further work is recommended for this site. The artifact scatter here is very sparse and the depth of the soil is less than 15 centimeters. This suggests that no undisturbed deposits are present.

**23HE902**

No further work is recommended for this site. A combination of surface collection and shovel testing indicated that the artifact distribution here is sparse and that the site context is disturbed by a road and agricultural activities.

**23HE903**

No further work is recommended for this site due to the sparseness of the artifact distribution, which consisted entirely of flakes and debitage. This suggests that the site has little potential to contribute significant data.

**23HE904**

No further work is recommended for this site due to the fact that no undisturbed deposits are present and the sparseness of the artifact distributions. This suggests that there is little potential for this site to yield significant data.

**23HE905**

No further work is recommended for this site due to the sparseness of the scatter and the disturbed nature of the setting.

**23HE906**

No further work is recommended here because of the very small artifact inventory recovered (four items). This suggests that the site has little potential to contribute significant data.

**23HE907**

It is recommended that this site be tested to see if undisturbed deposits are present and if the site is threatened by impacts associated with the operation of the reservoir. The presence of a Standlee point, indicating a Late Archaic-

Woodland occupation, suggests that data from this site could contribute data to two research problems. The first of these is the delineation of settlement patterns in the study area. Study of this site could contribute to our understanding of how tributary streams adjacent to the prairie are exploited. In addition, this site could contribute data to the study of the apparent cultural continuity that characterizes the last 2500 years of prehistory in the study area. This site should be monitored periodically to see if it is being impacted by mechanical effects resulting from periodic inundation.

**23HE908**

No further work is recommended for this site. The artifact distribution here is sparse and may represent materials which have eroded down the slope from above. This and the absence of diagnostic artifacts suggests that this site has little potential to contribute significant data.

**23HE909**

No further work is recommended for this site because it was an isolated find.

**23HE911**

It is recommended that this site be tested to determine if undisturbed deposits are present should the site be threatened by activities associated with the operation of the reservoir. If such deposits are present, then this site has potential to contribute data to the problem of settlement patterns in the study area. Specifically, data from this site would be useful for increasing our understanding of the exploitation of major tributaries of the South Grand. The site should be monitored periodically to determine if it is being impacted by mechanical effects associated with periodic inundation.

**23HE913**

No further work is recommended for this site because of the extremely disturbed context of the site and the fact that only two items were recovered from both shovel testing and surface collection.

**23HE914**

No further work is recommended for this site because of the disturbed nature of the site surface and the fact that only five items were recovered from the shovel testing.

**23SR966**

No further work is recommended for this site. Shovel testing here indicated that the soil here is thin and rocky, which means that no undisturbed deposits are present. This fact, and the low number of artifacts recovered by shovel testing and surface collection, suggests that this site has little potential to yield significant data.

**23SR967**

No further work is recommended for this site. Although a Category 306 hafted biface was found indicating a Late Archaic-Woodland period of occupation of the site, the shovel testing revealed that no undisturbed deposits are present at this site. For this reason, it is not likely that this site will yield significant data.

**23SR968**

No further work is recommended for this site. After a shovel test yielded two flakes, seven additional shovel tests failed to recover any additional artifacts. This indicates a very low artifact density and little potential for this site to yield significant data.

**23SR969**

No further work is recommended for this site due to the shallowness of the soil, which is less than 10 cm. This means there are no undisturbed deposits present and this makes it highly unlikely that the site can yield significant data.

**23SR970**

It is recommended that this site be tested to determine if undisturbed deposits are present. A potentially diagnostic hafted biface (Category 400) was found here. If undisturbed deposits are present, then data may be present to permit assessment of the culturalhistorical placement of this type. Study of this site would also contribute to the general problem of the delineation of settlement patterns in the study area. The site should be monitored periodically to assess whether or not it is being affected by mechanical effects associated with periodic inundation.

**23SR971**

No further work is recommended for this site due to lack of undisturbed deposits and sparseness of the artifact scatter. This suggests that this site has little potential to yield significant data.

**23SR972**

No further work is recommended for this site. The artifact inventory is low and shovel testing indicated little potential for undisturbed deposits.

**23SR973**

No further testing is recommended for this site because it is an isolated find of a uniface.

**23SR974**

No further work is recommended for this site due to the sparseness of the artifact distribution and the evidence of disturbance in the site area making the potential for undisturbed deposits low here.

23SR975

It is recommended that this site be tested to determine if there are any undisturbed deposits. An Etley point was found here, indicating a Late Archaic occupation of the site. Data from undisturbed contexts from this site could shed light on the nature of settlement patterns during the period. This could also contribute to understanding what factors condition the differential distribution of Etley and Nebo Hill sites noted by Joyer and Roper (1980). The site should be monitored periodically to assess whether it is being impacted by mechanical effects caused by periodic inundation.

23SR976

No further work is recommended for this site due to the sparseness of the scatter and the absence of diagnostic artifacts.

23SR977

No further work is recommended here due to the sparseness of the artifact scatter and the disturbance to the site context caused by channelization of the slough that bisects the site.

23SR978

No further work is recommended for this site because of the sparseness of the scatter. In addition, shovel testing here indicated that the artifacts present would be restricted to the plowzone.

23SR979

No further work is recommended for this site due to the sparseness of the scatter (two items) and the evidence of erosion of the site surface.

23SR980

No further work is recommended for this site. Although shovel testing recovered a wide variety of artifacts, it was also noted that the artifacts were restricted to the plowzone.

23SR981

No further work is recommended for this site. Shovel testing indicated that the artifacts present were restricted to the plowzone. Because of this, there is little potential for this site to have undisturbed deposits.

23SR982

No further work is recommended here because the shovel testing indicated that the artifacts present are restricted to the plowzone. The low potential for undisturbed deposits suggests that there is little chance for this site to contribute significant data.

**23SR983**

No further work is recommended for this site. Shovel testing here noted that the soil was very shallow (less than 15 cm) and that portions of the site surface were disturbed by erosion and a road.

**23SR984**

No further work is recommended for this site due to the very eroded nature of the site surface.

**23SR985**

No further work is recommended for this site. The artifact distribution is sparse and shovel testing indicated that the artifacts present were only in the plow zone.

**23SR986**

No further work is recommended for this site due to the low volume of artifacts recovered during the surface collection. This indicates little potential for this site to contribute significant data.

**23SR987**

No further work is recommended here because of the sparseness of the artifact scatter and the lack of potential for undisturbed deposits.

**23SR988**

No further work is recommended for this site due to the low artifact density and the low potential for undisturbed deposits.

**23SR989**

No further work is recommended for this site due to the low volume of artifacts recovered (six items) and the low potential for undisturbed deposits.

**23SR990**

No further work is recommended for this site. This is because of the low density of artifacts present. This suggests that the site has little potential to contribute significant data.

**23SR991**

No further work is recommended for this site because of the low volume of artifacts recovered (six items). This indicates little potential to contribute significant data.

**23SR992**

No further work is recommended here because only two items were recovered during an intensive inspection and collection of the site surface. This suggests that the site has little potential to contribute significant data.

**23SR993**

No further work is recommended for this site because of the low density of artifacts present. In addition, shovel testing here indicates that the artifacts are restricted to the plowzone.

**23SR994**

No further work is recommended for this site. Both surface collection and shovel testing indicated a low density of artifacts. The location of this site on a cultivated slope also suggests that there is a low potential for undisturbed deposits here.

**23SR995**

No further work is recommended here. A surface collection in an area of excellent visibility yielded only three artifacts, indicating that this site has little potential to contribute significant data.

**23SR996**

This site is an isolated find of one uniface. For this reason, no further work is recommended here.

**23SR997**

This site is multicomponent, with diagnostic artifacts indicating occupation from the Late Archaic to the Late Prehistoric. In addition, two potentially diagnostic hafted bifaces were found here. This site should be tested to determine if undisturbed deposits are present. If they are, then this site has potential to contribute data to two of the major research problems in the study area, the delineation of settlement patterns and the study of the apparent cultural continuity of the last 2500 years of prehistory of the study. For example, a Snyders point, diagnostic of the Middle Woodland, was found here. If undisturbed deposits are present, they may contain data useful in analyzing the nature of the Middle Woodland occupation of the study area. The study of the apparent cultural continuity that characterized the later part of the prehistory of the study area could also be investigated at this site. Are the various diagnostics found here separated in time or are they contemporaneous? An answer to either of these questions could greatly enhance our understanding of later prehistoric adaptations. This site should also be monitored periodically to assess whether it is being impacted by mechanical effects associated with periodic inundation.

**23SR998**

No further work is recommended for this site because of the low artifact density and the absence of undisturbed deposits. This indicates that this site has little potential to contribute significant data.

**23SR999**

No further work is recommended for this site. Shovel testing here indicated that the artifacts were contained entirely within the plowzone. This suggests little potential for this site to contribute significant information.

**23SR1000**

No additional work is recommended for this site. Shovel testing here indicated that the depth of the soil was so shallow that there is no potential for undisturbed deposits.

**23SR1001**

No further work is recommended for this site. This is because the site area is eroded and there are no undisturbed deposits present. This is also indicated by the recovery of two Early Archaic points from the surface.

**23SR1002**

No further work is recommended for this site because of the low density of artifacts and because shovel testing indicated that the artifacts present were restricted to the plowzone.

**23SR1003**

No further work is recommended for this site. The artifact density here is low and there is little potential for there to be undisturbed deposits. For these reasons, it is not likely that this site will yield significant data.

**23SR1006**

No further work is recommended for this site because it is an isolated find of one biface.

**23SR1007**

No further work is recommended for this site. Shovel testing indicated that the artifact density was low and that the artifacts present are restricted to the plowzone.

**23SR1033**

No further work is recommended for this site. The density of artifacts here is low and there is little potential for undisturbed deposits. For these reasons, it is not likely that this site can yield significant data.

**23SR1034**

No further work is recommended for this site. The density of artifacts here is low and the potential for undisturbed deposits is low. This suggests that there is little chance that this site will yield significant data.

**23SR1035**

No further work is recommended for this site. No culturally diagnostic artifacts were found, the density and diversity of artifacts is low, and the site setting indicates little chance for undisturbed deposits. For these reasons, the site has little potential to contribute significant data.

**23SR1036**

This site should be tested if it is threatened by any activities associated with the operation of the reservoir. If undisturbed deposits are present, then this site has potential to contribute data to the problem of the nature of settlement patterns during the Late Archaic-Woodland period here. The recovery of a large number of cores and bifaces here indicates that the site was used for lithic raw material reduction and tool production. The presence of river cobble cortex on many of the cores found here suggests that they were procured from the stream bed of Weaubleau Creek. This pattern of procurement contrasts strongly with the quarry-based pattern assumed by Ray (1981) as the basis for his analysis of raw material distributions and use. Study of materials from this site could provide a comparative basis for the lithic technological strategies employed on non-quarried versus quarried raw materials. The site should be monitored periodically to assess whether it is being impacted by mechanical effects from periodic inundation.

**23SR1037**

This site should be tested to determine if undisturbed deposits are present if the site is threatened by impacts from the operation of the reservoir. Although no diagnostic artifacts were found, study of this site could augment studies conducted on materials from 23SR1036. A large number of cores and bifaces were found here, suggesting that the study of lithic technology could be done here. There were also a large number of utilized flakes here which may indicate a slightly different use of the site than that at 23SR1036. Studies of this kind will contribute to the delineation of settlement patterns in the study area.

**23SR1042**

No further work is recommended for this site. The artifact scatter is very sparse and located on a slope indicating little potential for undisturbed deposits.

**Easement Lands**

Our survey located 48 prehistoric sites within the easement land portion of the Ten-Year Floodpool. The acreage surveyed totaled 7,285, or 18.21 percent of the estimated 40,000 acres in this zone. As this was the first systematic survey of this part of the Ten-Year Floodpool, there is no way to compare the results of this survey with any other. The site density estimate that results from this survey is 4.21 sites per square mile, which is in accord with the general trend of decreasing site density as one moves east to west across the study area. This estimate is undoubtedly affected by the proscription against shovel testing to discover sites in the easement lands. As was noted above, this requirement forced us to inspect areas with good surface visibility, that is, cultivated fields. This caused us to miss large areas where the probability of encountering sites would have been high, such as the terraces along the Sac River, which were in pasture, and a segment of the Osage River west of Taberville, which was either forested or in pasture. In addition, it was not possible to survey large areas where the probability would have been low, such as along the South Grand and parts of the Osage near Schell City. It is our opinion that an opportunity to survey these zones would raise the estimated site density significantly. For example, the survey of tracts of land around the confluence of Monegaw Creek with the Osage and the confluence of Clear Creek with the Osage resulted in the location of 17 sites, or 43.59 percent of the sites found in Stratum 24, although the amount of acreage surveyed is not in this proportion.

The evaluation of potential eligibility for the sample of sites from the easement lands is being conducted separately from those of the fee lands for two reasons. The first is that the easement lands are not included within those lands included within the Harry S. Truman Dam and Reservoir Multiple Resource Area. The second is that the sample of sites from the easement lands is known only from surface collection. There is no information about the depth of deposits at any of these sites except for what can be gleaned through visual observation.

The fact that the easement land sites are not with the Truman Multiple Resource Area means that they are not automatically eligible by virtue of their presence within the Multiple Resource Area. In order to evaluate their potential eligibility, then, it will be necessary to propose some domains of significance against which each site may be evaluated. At this particular juncture, it seems appropriate to continue with those domains outlined by Roper (1981:3-40) and employed above in the development of recommendations for the fee land sites. These domains are chronology, settlement systems and cultural continuity. Discussion of these areas will not be repeated here.

The evaluation of each site in terms of their potential to yield significant information about these domains will take into consideration the lack of knowledge about the subsurface properties of each site. For this reason, it must be understood that for each site suggested to be potentially eligible, that the initial step for any additional work on each site would be a testing program to determine if the sites were indeed potentially eligible for nomination to the National Register of Historic Places.

Rather than have a site by site presentation of each recommendation, a table will be presented that will show whether a site is considered to be potentially eligible and the domain or domains to which it is thought data from these sites may contribute. This approach is more useful here because of the greater similarity of the physical settings of these sites and the fact that they all have been disturbed by agricultural activities. Most of the sites reported here occur on cropland on either the floodplain ($T_2O$) or the first terrace (T-1) of the major rivers or tributaries of the study area. The few sites that do not fit into this scheme will be noted by an U (for Upland). For the upland sites, it should be understood that the potential for undisturbed deposits is very low. This will be taken into account here. The lack of knowledge about subsurface deposits makes it very difficult to evaluate these sites for their potential to help resolve chronological problems. For this reason, a convention will be adopted here. If a site has diagnostic cultural materials present, then it will be considered to have the potential to contribute to chronological problems.

Table 18 presents the evaluations of significance for the sample of easement land sites, subject to the conditions above. Following this table, will be a limited site by site discussion of certain sites.

Any plan for the management of the prehistoric cultural resources on the easement lands will necessarily be affected by the legal stipulations of the perpetual flowage easement obtained by the Corps of Engineers from the various landowners to permit the periodic inundation of their lands by the waters of the reservoir. At the present time, it is clear that there is no provision for cultural resources in the easement lands. This is evidenced by the fact that permission must be obtained from each landowner to conduct archeological survey and that subsurface testing is not permitted. The effects of these constraints on the survey reported here have been discussed above. It is our recommendation that the Corps of Engineers investigate ways by which access is permitted to sites regardless of owner permission. Such a policy would facilitate the monitoring which need be the only intensive management strategy that needs to be employed for the near future. As discussed above in the section on impacts, there are positive benefits for cultural resources by putting lands into flowage easements. The landowners are proscribed against the building of structures or impoundments and are generally constrained to keep the land in agricultural use or abandon it. This suggests that, except for periodic inundation, these sites will not suffer any additional impacts besides those associated with the practice of agriculture. We would recommend regular periodic monitoring of the sites recommended as eligible in order to assess whether or not periodic inundation is causing mechanical effects resulting in site destruction. Should this be found to be the case then the appropriate measures to stabilize or mitigate the site should be taken.

## CONCLUSIONS

A total of 180 prehistoric sites was found and evaluated during the archeological survey reported here. On the fee lands, 132 sites were found. It was recommended that 23 of these be tested and monitored if threatened or impacted by activities associated with the operation of the reservoir. A total of 48 sites was found on the easement lands. Of these, 15 were considered potentially eligible subject to the constraints discussed above. As with the fee land sites, it was

## TABLE 18

## RECOMMENDATIONS FOR EASEMENT LAND SITES

| Site No. | Eligible | Chronology | Settlement Systems | Cultural Continuity |
|---|---|---|---|---|
| 23BT56 | Yes | X | X | X |
| 23BT57 | No | | | |
| 23BT58 | No | | | |
| 23BT59 | No | | | |
| 23BT60 | Yes | X | X | |
| 23BT61 | No | | | |
| 23HE892 | Yes | X | X | |
| 23HE893 | Yes | X | X | |
| 23HE894 | Yes | X | X | X |
| 23HE895 | No | | | |
| 23HE896 | No | | | |
| 23HE897 | No | | | |
| 23HE898 | No | | | |
| 23HE910 | No | | | |
| 23HE912 | Yes | | X | |
| 23SR1008U | No | Isolated Find | | |
| 23SR1009 | Yes | X | X | |
| 23SR1010 | No | | | |
| 23SR1011 | Yes | X | X | |
| 23SR1012 | Yes | X | X | |
| 23SR1013 | No | | | |
| 23SR1014U | No | Isolated Find | | |
| 23SR1015 | Yes | X | X | X |
| 23SR1016 | Yes | X | X | |
| 23SR1017 | No | Isolated Find | | |
| 23SR1018 | Yes | X | X | |
| 23SR1019 | No | | | |
| 23SR1020 | No | | | |
| 23SR1021 | Yes | X | X | |

TABLE 18 (Continued)

| Site No. | Eligible | Chronology | Settlement Systems | Cultural Continuity |
|---|---|---|---|---|
| 23SR1022 | No | | | |
| 23SR1023 | Yes | X | X | |
| 23SR1024 | No | | | |
| 23SR1025U | No | | | |
| 23SR1026 | No | | | |
| 23SR1027 | No | | | |
| 23SR1028 | No | | | |
| 23SR1029 | No | | | |
| 23SR1030 | No | | | |
| 23SR1031U | No | | | |
| 23SR1032 | Yes | X | X | |
| 23SR1038 | No | | | |
| 23SR1039 | No | | | |
| 23SR1040 | No | | | |
| 23SR1041 | No | | | |
| 23VE129 | No | | | |
| 23VE130 | No | Isolated Find | | |
| 23VE131 | No | Isolated Find | | |
| 23VE132 | No | | | |

recommended that these sites be periodically monitored to determine if they are being impacted by the reservoir. For the entire sample of sites, the evaluations of significance were made in terms of each site's potential to yield significant data concerning the three major problem areas outlined by Roper (1981b:3-40). These are chronology, the delineation of settlement systems, and the investigation of cultural continuity, or the apparent similarity of adaptation from the latter part of the Late Archaic to the Late Woodland. While such domains may accurately be considered to be broad and that it might be difficult to find a site that was not potentially eligible, the recommendations offered here also take into account what was learned about site context and content by the University of Missouri (Roper 1981a). This is that many of the sites are strictly plowzone sites. That is, the artifacts are restricted to the plowzone in spite of the fact that they are in alluvial settings. A second observation was that many of the sites here are very small, and that surface collection can remove most, if not all, of the artifacts present. With these provisos in mind, the recommendations offered above suggest that these sites can contribute to a broader understanding of the chronology of the study area, the nature of prehistoric adaptations or the delineation of settlement systems, and the study of cultural continuity.

In our research design, concern for the latter two questions guided the study. Recognizing that this study would utilize primarily data from surface contexts, it was proposed to evaluate aspects of Binford's (1980) forager-collector model of hunter-gatherer adaptation. This model argues that adaptations are conditioned by the resource structure of a setting and that mobility strategies will be employed in order to distribute people on the landscape in order to exploit resources during their period of availability. It was argued that the Truman Reservoir area was an excellent place to evaluate this model, given the stark differences in resource structure that obtain between forest and prairie settings. Forests are high primary biomass-low secondary biomass settings as contrasted to prairies, which have low primary biomass-high secondary biomass. The model evaluated here suggests that a foraging adaptation will be characteristic of high primary biomass settings and that a residential mobility strategy will be employed to put people on the landscape. A collecting adaptation will be characteristic of low primary biomass settings and that logistical mobility will be employed to place people of the landscape. These examples here are, of course, the ideal types and real adaptations that employ a mix of residential and logistical mobility strategies. This is especially true in temperate latitudes where there can be substantial year to year variation in temperature and rainfall, which cause changes in the period of availability and the quantity and quality of of exploited resources.

It was argued that aspects of the lithic technology would be especially sensitive monitors of the various mobility strategies because the organization of a technology is directly responsive to the conditions imposed by resource structure. To evaluate this argument, various attributes of cores, bifaces, unifaces and debitage were isolated and analyzed in order to see if they patterned in the intended direction. The results of this analysis were largely confirmatory of the model. The major area of fuzziness was in Aggregate 8 which occurs along the Osage River in the extreme western part of the reservoir. This is due, in our opinion, to the fact the transition from forest to prairie in this area is very gradual. This may be due to the presence of outcrops of Mississippian strata in this area (See Figure 2). This could be evaluated by subdividing Aggregate 8 into finer

units. In general, the results of this study were very encouraging and suggest that this analytical strategy could be a productive way in which to evaluate differences and similarities between and among sites present in the study area.

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